June 29, 1965 C. D. McKIM 3,191,618

CURVED SEAT REED VALVE

Filed Oct. 29, 1962

FIG_1

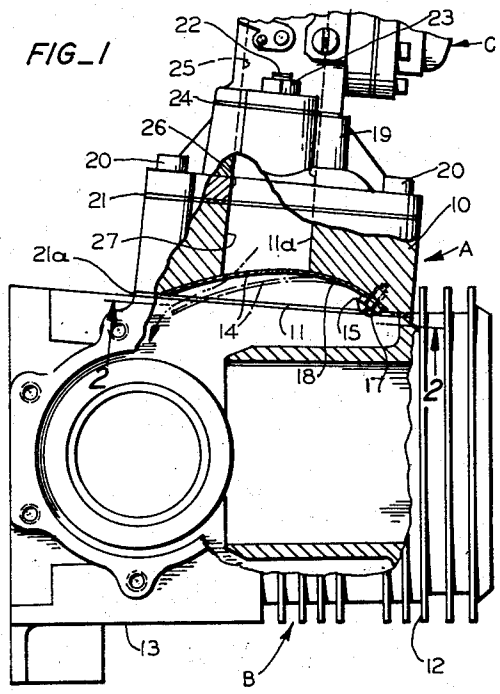


FIG_2

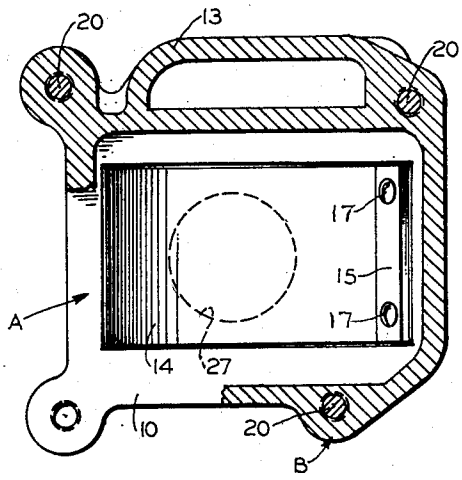


FIG_3

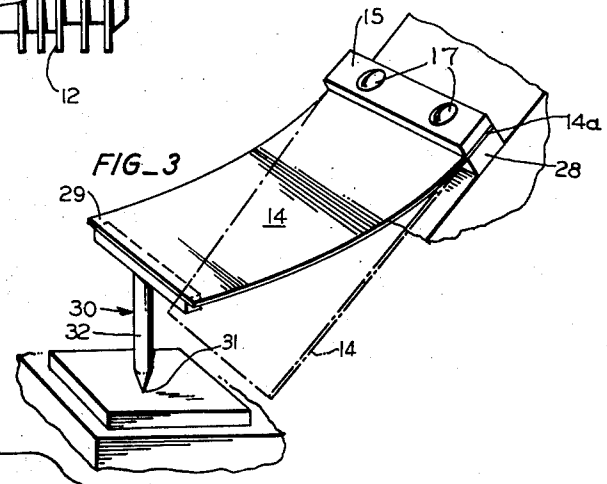


FIG_4

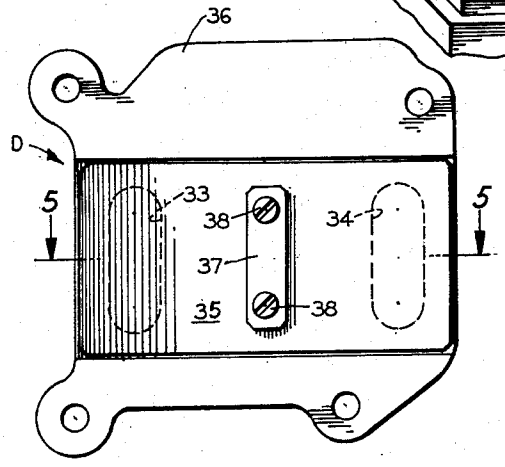
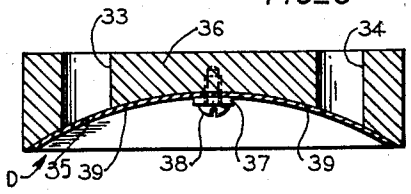


FIG_5



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United States Patent Office 3,191,618 Patented June 29, 1965

3,191,618

CURVED SEAT REED VALVE

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Filed Oct. 29, 1962, Ser. No. 233,581
3 Claims. (Cl. 137—525.3)

The present invention relates to valves, and pertains more particularly to a curved seat reed valve.

Reed valves are widely used in industry where a light weight, quick acting, demand type of valve is desired, for example, in certain types of pumps, small gasoline engines, particularly of the two cycle type, and other uses well known to those familiar with valves.

One particularly important field of use for such valves is in small, high performance, two cycle engines of the type used in small racing vehicles known as "karts." In engines used to drive these karts, reed valves are used to control the passage of the fuel-air mixture from the carburetor into the crankcase. When the engine is operating at extremely high r.p.m., however, even these conventional reed valves have a tendency to either float, or to flutter from bounce in closing, and when either of these conditions occur the power and efficiency of the engine drops off sharply.

The present invention consists in providing a valve reed seated on a curved seat, the curvature of the seat conforming to a naturally flexed condition of the reed.

Another object of the invention is to provide a reed valve wherein the reed is flexed to curved condition and is seated on a seat which conforms substantially to the normal curvature of the reed in such flexed condition.

Another object of the invention is to provide an improved, curved seat, reed valve.

These, and other objects and advantages of the invention, will be apparent from the following description and the accompanying drawings, wherein:

FIG. 1 is a view, partly in side elevation and partly in medial section, of a reed valve assembly embodying the present invention and mounted on the crankcase-cylinder block of a two cycle engine.

FIG. 2 is a sectional view taken along line 2—2 of FIG. 1, a portion of the engine block being broken away to the plane of the valve block.

FIG. 3 is an enlarged, perspective view of the valve reed shown in FIGS. 1 and 2 as it would appear when firmly gripped at one end thereof, and with its other end supported by a T-shaped bar to flex the valve reed to a curved condition corresponding to that shown in FIGS. 1 and 2, the normal, flat, unstressed condition of the valve reed being shown in broken lines.

FIG. 4 is a plan view somewhat similar to FIG. 2, but showing a modified, double port form of the invention.

FIG. 5 is a sectional view taken along line 5—5 of FIG. 4.

Referring briefly to the form of the invention shown in FIGS. 1–3, a valve A comprises a valve block **10** mounted over the intake port **11** of a generally conventional, air cooled, two-cycle engine block B. The latter consists of unitary engine cylinder portion **12** and crankcase portion **13**. A valve reed **14**, of spring sheet material, such as, for example, shim stock, secured by an anchor bar **15** and screws **17** to a curved seat **18** formed on the inner or engine side of the valve block **10**.

The curvature of this seat **18** conforms to the normally flexed condition of the valve reed **14** when the latter is flexed laterally from its normally straight position as shown in FIG. 3. The valve reed thus bears throughout its length against the valve seat, with the seating bias at the free end of the reed as great as, or greater than, that throughout the remainder of the reed. Thus, the reed tends to seat quickly, effectively, and without float or bounce after each opening thereof. This provides greatly increased efficiency, particularly at high speeds, over a reed valve seated on a conventional flat seat.

Referring to the drawings in greater detail, the illustrated unitary crankcase and cylinder block B is conventional, and requires no detailed explanation for one familiar with this type of engine. The usual intake port **11** is provided in a side of the engine block B, and the valve block **10**, and a usual carburetor mounting pad **19** are attached to the engine block B over this intake port by bolts **20**. Sealing gaskets **21** and **21***a* seal the joints between the carburetor mounting pad **19** and the valve block **10**, and between the latter and the engine block B, respectively.

A conventional carburetor C is mounted on the carburetor mounting pad **19**, and is secured thereto by studs **22** and nuts **23**. The carburetor is sealed to its mounting pad **19** by a gasket **24**. The usual throat **25** (broken lines, FIG. 1) of the carburetor C registers with aligned passages **26** through the carburetor mounting pad **19**, and **27** through the valve block **10**. The latter, as mentioned previously herein, registers with the intake port **11** in the engine block B.

The curved valve seat **18**, which is an important feature of the present invention, is formed on the inner or engine side of the valve block **10**, and is curved to conform to the normal curvature of a valve reed **14** to be used therewith when said reed is securely clamped to one end of the seat **14** by the transverse mounting bar **15** and screws **17**.

The curved shape of the valve seat **18** is determined by the normal curvature of the valve reed **14** when the mounting end portion **27** (FIG. 3) thereof is gripped securely between the bar **15** and a suitable support pad **28**, and the other or free end **29** of the reed is flexed laterally a required amount as by the head of a T-shaped member **30** bearing for free universal pivotal movement on a point **31** formed on the lower end of its stem **32**. Thus the T-shaped member **30** is free for tilting movement in any direction about its supporting point **31**, and the reed **14** in FIG. 1 is in a normally flexed condition.

The normally flexed curvature of the convex side of the reed **14** thus found is reproduced on the valve seat **18**. The reproduction may be performed in any desired way, a number of which ways are well within the knowledge and capability of a skilled machinist or other artisan. For example, a mold may be made thereof in plaster of Paris or other suitable molding material, and the shape thus provided may be reproduced in metal as by machining or casting to provide the seat **18** of FIGS. 1 and 2.

The stiffness of the valve A, i.e., its resistance to opening and its tendency to close rapidly, may be increased by: (1) increasing the flexure or curvature of the valve seat, and therefore the initial or seated curvature of the valve reed; (2) increasing the thickness of the reed; or (3) employing stiffer material from which to make the reed.

When a valve embodying the present invention is to be used for an extremely high speed engine, for example, one which will turn at a speed of the order of ten or twelve thousand revolutions per minute, a thin reed and a substantial curvature of the valve seat would be desired, since this would insure full and rapid opening, and quick and complete closing of the valve, and would tend to eliminate float and bounce. For a more modest speed, for example five or six thousand r.p.m., the curvature of the valve seat may be reduced to provide freer and fuller opening of the valve at such lower speeds.

Aside from the advantages explained previously herein, the operation of the valve A is in general similar to that of any conventional, flat reed valve. When a piston (not shown) in the engine cylinder **12** moves from bottom dead center to top dead center therein, and the pressure within the crankcase **13** is thereby reduced below atmospheric pressure sufficiently to overcome the spring bias of the

valve reed 14, the valve opens, and remains open until the difference in these pressures is reduced sufficiently to allow the spring bias of the reed 14 to return it to its seat. When the pressure within the crankcase 13 is greater than that on the outer side of the valve, the reed 14 is urged thereby toward its seated condition.

In the modified form of the invention shown in FIGS. 4 and 5, a double ended valve reed 35 controls double inlet ports 33 and 34, formed in a valve block 36. The valve reed 35 is secured medially of its length between the ports 33 and 34 by a transverse mounting bar 37 and screws 38. As in the form of the invention shown in FIGS. 1 and 2, the valve seat 39 conforms to the normal curvature of the reed 35 when the latter is flexed as shown.

The operation and other features and advantages of the double ended reed valve shown in FIGS. 4 and 5 are in general similar to those of the single reed valve A shown in FIGS. 1 and 2, and the operation of the valve shown in FIGS. 4 and 5 will be obvious to one who has read the explanation pertaining to the form of the invention shown in FIGS. 1–3.

The invention provides a simple and effective reed valve, and one which has been found to increase the efficiency and power of a two cycle engine, particularly at high r.p.m., and also insures efficient performance at intermediate and lower speeds, due to its full and rapid opening and highly effective closing action, and the absence of a tendency to bounce, flutter or float.

While I have illustrated and described a preferred embodiment of the present invention, and one modified form thereof, it will be understood, however, that various changes and modifications may be made in the details thereof without departing from the scope of the invention as set forth in the appended claims.

Having thus described the invention, what I claim as new and desire to protect by Letters Patent is defined in the following claims.

1. A reed valve comprising:

a valve reed of thin, normally flat, single thickness, springy, sheet material, which, when relieved of external stresses will lie flat, but which is flexed lengthwise thereof to define a curve determined by the normal flexure of the reed when the latter is fixedly held at one end thereof, and the other end thereof is offset laterally and without torque a selected distance from a plane tangent to the fixedly held end of the reed when so held by a force applied transversely to the other end of the reed,

a valve seat having a valve opening therein and curved to conform to the convex side of the thus flexed valve reed,

a valve mounting surface co-extensive with the valve seat and laterally adjacent the valve opening therein, and

means fixedly securing such fixedly held end of the valve reed onto the valve mounting surface, thereby flexing the normally flat valve reed into conforming relation with the valve seat throughout the length of the reed.

2. A reed valve comprising:

a valve reed of thin normally flat, single thickness, springy, sheet material, which, when relieved of external stresses will lie flat,

a valve seat having a valve opening therein and curved to conform to a selected, transversely flexed condition of the valve reed to be mounted thereon,

a valve mounting surface co-extensive with the valve seat and laterally adjacent the opening therein,

and means securing a portion of the valve reed remote from the flexed end thereof onto said valve mounting surface, thereby transversely flexing the reed into said transversely flexed condition for conforming relation and overall contact with the valve seat.

3. The method of providing a substantially uniformly flexed reed valve structure which comprises shaping a valve seat to conform to the curve defined by a thin, normally flat, springy valve reed of uniform thickness when rigidly held at one end thereof and deflected transversely to the normal plane of the valve reed by a laterally directed force applied to the free end of the reed, and then mounting one end portion of a thin, normally flat valve reed of uniform thickness on a surface adjacent to and co-extensive with one end of the valve seat and drawing the thus applied end of the valve down closely to the mounting surface to thereby flex the normally flat valve reed into overall, substantially uniformly flexed conformity with the valve seat.

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