United States Patent [19]

Wadensten

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[45] ***Feb. 5, 1974**

[54] **ROTATING PNEUMATIC VIBRATOR**

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[*] Notice: The portion of the term of this patent subsequent to Feb. 1, 1989, has been disclaimed.

[22] Filed: **May 14, 1971**

[21] Appl. No.: **143,451**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 42,791, June 2, 1970, Pat. No. 3,638,914.

[52] **U.S. Cl.**..... **259/1 R,** 259/DIG. 43, 308/165, 418/178

[51] **Int. Cl.**..... **B01f 11/00,** F01c 21/02

[58] **Field of Search**..... 259/1 R, DIG. 43, DIG. 44, 259/DIG. 16, DIG. 15; 308/163, 165; 418/178

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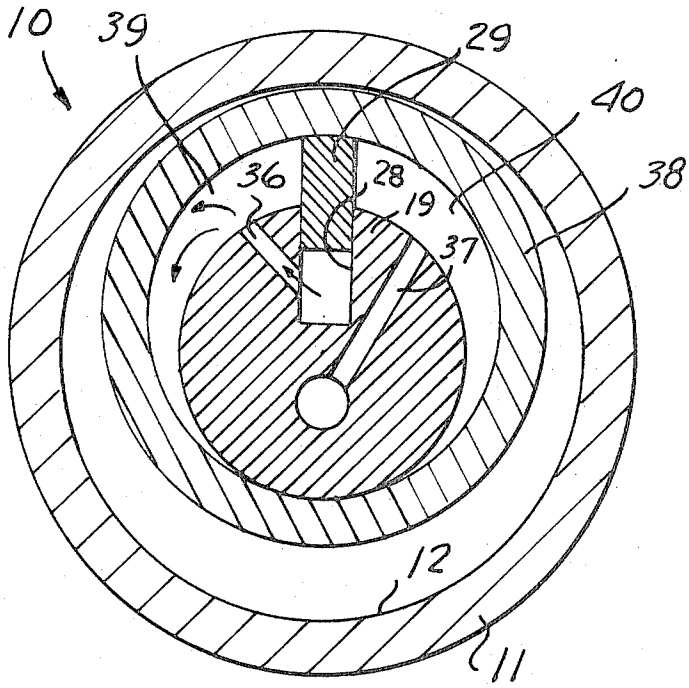
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[57] **ABSTRACT**

A rotating pneumatic vibrator in which a cylindrical housing is provided with an axial shaft spaced inwardly from the walls of the housing to provide a circular space between the shaft and the housing. A cylindrical rotor having a diameter greater than the shaft and smaller then the housing is mounted on the shaft for movement thereabout. A longitudinally extending radially moveable vane is mounted in the shaft and is arranged to be pneumatically pressed against the rotor. Air forces the vane against the rotor and escapes into the chamber formed between the shaft and the rotor, the air forces the rotor to move about the shaft and then escapes to the atmosphere with the rotor and vane returned to their beginning point. The motion is continuous and produces vibrations due to the movement of the rotor on the shaft.

Replaceable circular wear plates are fitted in each end of the housing to seal the ends of the rotor to prevent leakage.

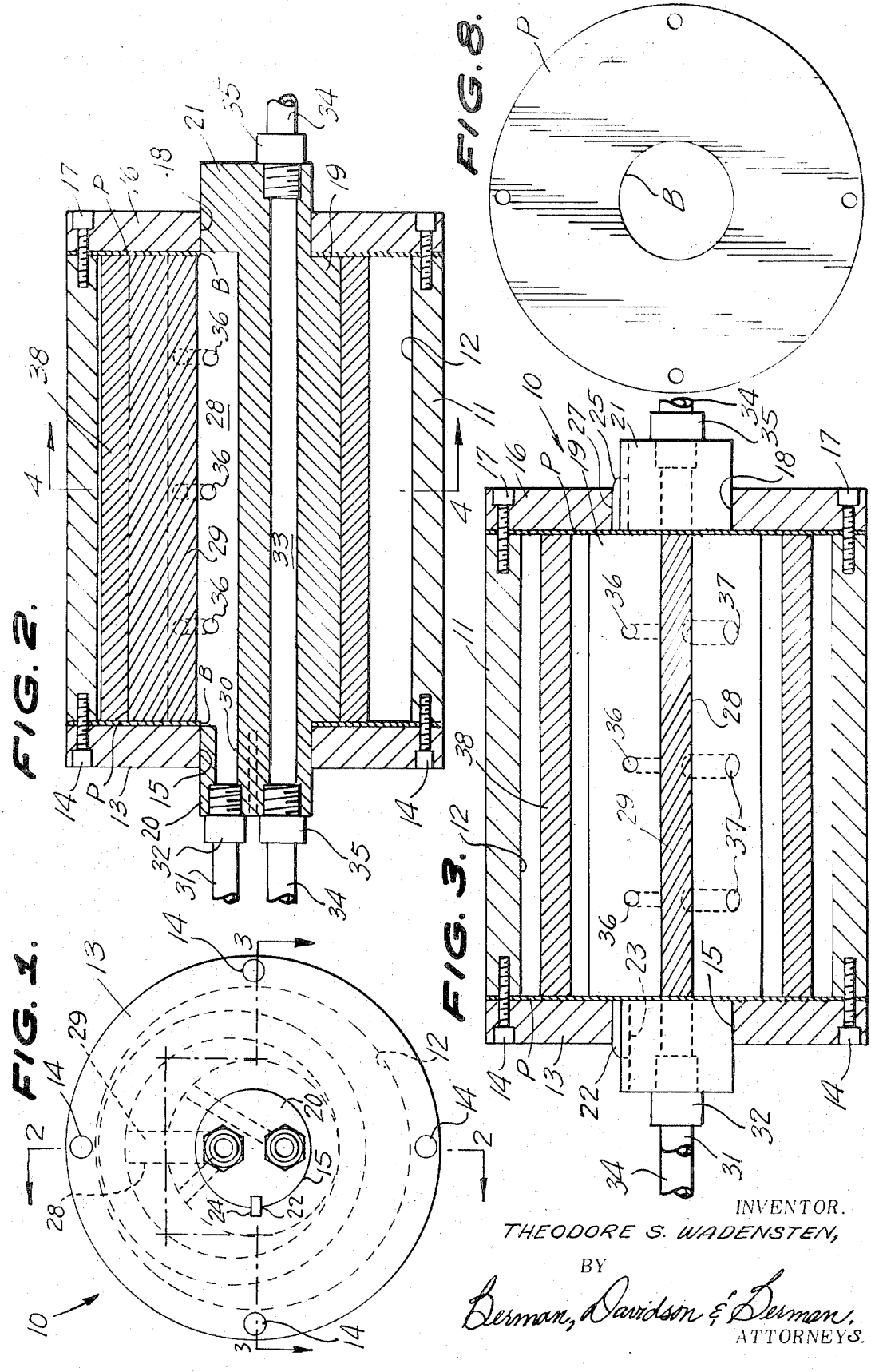
6 Claims, 8 Drawing Figures



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SHEET 1 OF 2



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FIG. 4.

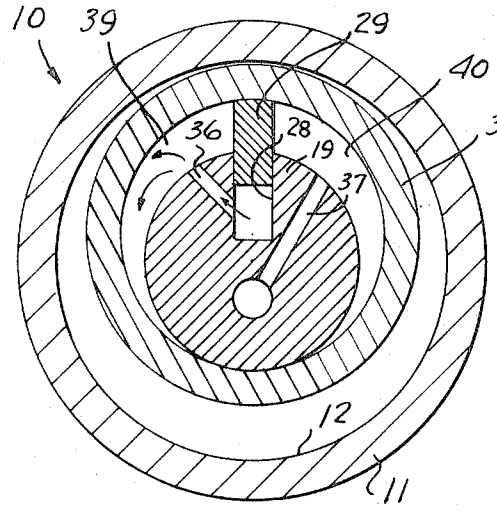
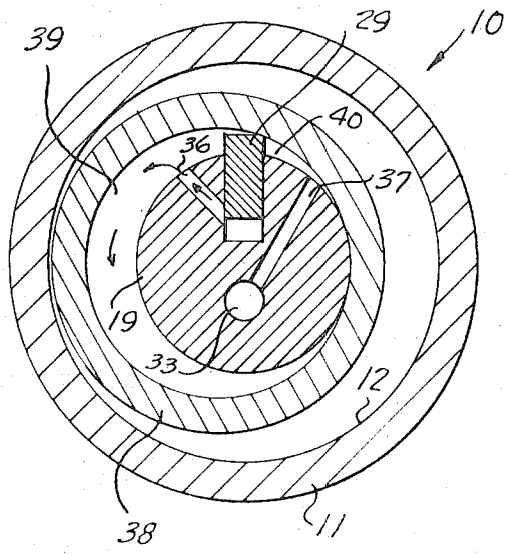


FIG. 5.



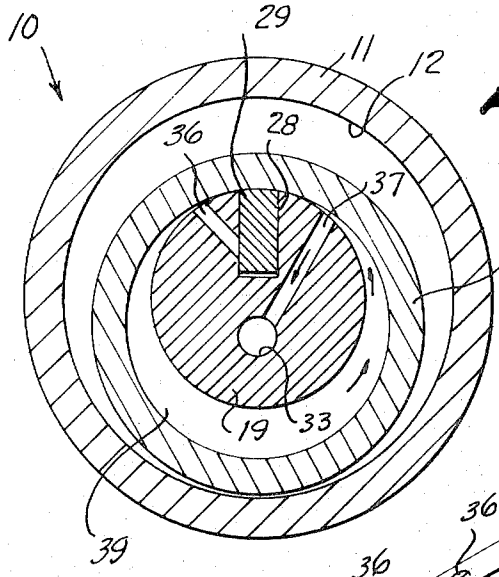
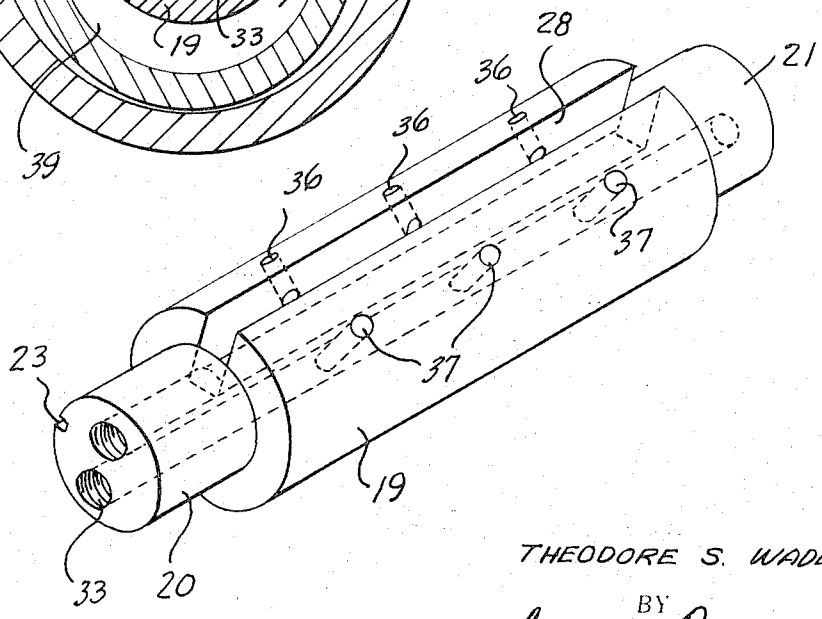


FIG. 6.

FIG. 7.



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ROTATING PNEUMATIC VIBRATOR

This application is a continuation-in-part of my copending application Ser. No. 42,791 filed June 2, 1970, entitled "Rotating Pneumatic Vibrator", now U.S. Pat. No. 3,638,914.

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to rotary pneumatic vibrators of the type which are caused to vibrate by the rotation of off center member within the vibrator.

SUMMARY OF THE INVENTION

The vibrator includes a cylindrical housing having a central fixed shaft mounted therein and spaced inwardly from the housing to provide a circular space surrounding the shaft. The shaft has a longitudinally extending radially moveable vane which is adapted to engage against the inner face of a circular rotor mounted between the shaft and the housing. The vane is pneumatically driven against the rotor and also serves as a valve to control the air flow into the space between the shaft and the rotor. As air pressure is applied to the vane and to the space between the shaft and rotor the rotor is caused to move about the shaft with the air escaping through ports on the far side of the shaft to permit the rotor to return to its starting position. The movement of the rotor creates a unbalanced condition and causes vibration in the device. Wear plates at each end of the rotor provide sealing to prevent leakage.

The primary object of the invention is to provide a rotating pneumatic vibrator having a minimum of working parts to permit a long life without excessive wear.

Other objects and advantages will become apparent in the following specification when considered in the light of the attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an end elevation of the invention;

FIG. 2 is a longitudinal sectional view taken along the line 2—2 of FIG. 1, looking in the direction of the arrows;

FIG. 3 is a horizontal sectional view taken along the line 3—3 of FIG. 1, looking in the direction of the arrows;

FIG. 4 is a transverse sectional view taken along the line 4—4 of FIG. 2, looking in the direction of the arrows;

FIG. 5 is a view similar to FIG. 4 with the elements in an advanced position;

FIG. 6 is a view similar to FIGS. 4 and 5 with the elements in a still further advanced position;

FIG. 7 is a perspective view of the shaft forming part of the invention; and

FIG. 8 is an elevational view of one of the wear plates removed from the housing.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings in detail, wherein like reference characters indicate like parts throughout the several figures, the reference numeral 10 indicates generally, a rotary pneumatic vibrator constructed in accordance with the invention.

The vibrator 10 includes a cylindrical housing 11 having a cylindrical bore 12 formed therein. A circular end plate 13 is secured to one end of the housing 11 by a plurality of cap screws 14. The end plate 13 has an axial bore 15 extending therethrough.

A circular end plate 16 is secured to the opposite end of the housing 11 by a plurality of cap screws 17. An axial bore 18 is formed in the circular plate 16. The circular plates 13, 16 are identical in every respect.

A circular wear plate P is secured to each of the end plates 13, 16 and has a central bore B formed therein.

A shaft 19 is positioned in the housing 11 and has a reduced diameter axial extension 20 at one end and a reduced diameter axial extension 21 at the opposite end thereof. The extension 20 projects through the bore B in the wear plate P and through the bore 15 of the end plate 13 and is locked thereto against rotation by a key 22 mounted in a keyway 23 in the extension 20 and a keyway 29 in the bore 15 of the end plate 13.

The extension 21 projects through the bore B in the end plate P and through the bore 18 of the end plate 16 and is locked against rotation to the end plate 16 by means of a key 25 seated in a keyway 26 in the extension 21 and a keyway 27 in the bore 18 of the circular plate 16.

The shaft 19 has a radial slot 28 formed therein and extending longitudinally from the extension 20 to the extension 21 as can be clearly seen in FIG. 7. The slot 28 is adapted to receive a generally rectangular vane 29 which extends from the end wall 13 to the end wall 16 and is adapted for radial reciprocation in the slot 28. A bore 30 threaded at its outer end extends through the extension 20 communicating with the slot 28 at its inner end. An air supply pipe 31 is adapted to be connected to the bore 30 by means of a fitting 32. A bore 33 extends through the shaft 19 and each of the extensions 20, 21 and has its opposite ends threaded to permit exhaust pipes 34 to be connected thereto by means of fittings 35.

A plurality of bores 36 extend angularly and outwardly from the slot 28 through the side of the shaft 19. The bores 36 terminate above the bottom of the slot 28 and are arranged so that with the vane 29 in its innermost position the inner ends of the bores 36 are obstructed to prevent the flow of air outwardly therethrough. The outer ends of the bores 36 and closely adjacent the slot 28 on one side thereof.

A plurality of exhaust bores 37 extend upwardly and angularly from the bore 33 through the side of the shaft 19 with their outer ends terminating closely adjacent the slot 28 on the side thereof opposite the bores 36.

A cylindrical rotor 38 having a length equal to the housing 11 is positioned between the shaft 19 and the housing 11 in engagement with the vane 29. The rotor 38 has an internal diameter substantially greater than the external diameter of the shaft 19 and has an external diameter substantially less then the internal diameter of the housing 11.

The vibrator described above includes eight parts namely the cylindrical housing 11, end plates 13, 16, wear plates P, shaft 19, vane 29, and rotor 38. All parts of the vibrator 10 are stationary with the exception of the rotor 38 and the vane 29.

In the use and operation of the invention the cylindrical housing **11** is rigidly secured to any device to be vibrated and the pipe **31** is connected to a source of air under pressure. The pipes **34** are connected to any exhaust system for leading the exhaust air away from the vibrator **10.**

In the use and operation of the invention compressed air enters through the bore **30** and enters the slot **28** raising the vane **29** into contact with the rotor **38** forcing the rotor **38** into contact with the shaft **19** immediately below the vane **29** assuming the position illustrated in FIG. **4.** This creates an air chamber **39** between the vane **29,** the rotor **38** and shaft **19,** as also can be seen in FIG. **4.** The bores **36** communicate with the chamber **39.** The second chamber **40** is formed on the opposite side of the shaft **19** and the bores **37** communicate with the chamber **40.** The chamber **39** is a high pressure chamber and the chamber **40** is a low pressure chamber.

Air flowing through the bores **36** from the slot **28** will increase the size of the chamber **39** forcing the rotor to the left and downwardly to the position as can be seen in FIG. **5.** The chamber **40** is decreased in size with the air flowing therefrom outwardly through the bores **37** into the exhaust bore **33.** As more air is supplied through the bores **36** the chamber **39** increases in size as can be seen in FIG. **6** and the chamber **40** disappears. As the rotor **38** comes to the position illustrated in FIG. **6** the chamber **39** communicates with the bores **37** and the vane **29** shuts off the inner ends of the bores **36** so that no more air is supplied to the chamber **39** and the high pressure air in the chamber **39** is permitted to begin to escape through the bores **37.** As soon as the vane **29** closes the bores **36** high pressure air begins to build up behind the vane **29** and it is forced upwardly to the position illustrated in FIG. **4** raising the rotor **38** and returning the rotor **38** to its beginning point as seen in FIG. **4.** The motion of the rotor **38** is a combination of rotation and impacting as it strikes the shaft **19** due to the force applied by the vane **29.** Vibration is thus created. With a steady supply of air under pressure several thousand impacts per minute are created in the vibrator **10.** The opposite ends of the rotor **38** are in sliding and sealing contact with the end plates **13, 16.** The vane **29** is also in sliding and sealing contact with the end plates **13, 16** as well as with the rotor **38.**

The wear plates P prevent leakage at the end of the rotor **38** and may be replaced as required by wear.

Having thus described the preferred embodiment of the invention it should be understood that numerous structural modifications and adaptations may be resorted to without departing from the spirit of the invention.

What is claimed is:

1. A rotary pneumatic vibrator comprising a cylindrical housing, a pair of circular end plates detachably secured to opposite ends of said housing, a circular wear plate secured between each end plate and said housing, a shaft mounted axially of said housing and extending through said end plates, means locking said shaft to said end plates to prevent relative rotation therebetween, said shaft having a radial slot formed therein extending longitudinally from one of said end plates to the other of said end plates, said shaft having an air inlet bore extending through one end thereof and communicating with the slot in said shaft, said shaft having an exhaust bore formed therein, and extending through at least one end thereof, a plurality of inlet bores extending through said shaft from the inner end portion of said slot through the side of said shaft, a plurality of exhaust ports extending from said exhaust bore through the side walls of said shaft, said inlet bores and said exhaust ports being positioned closely adjacent to and on opposite sides of said slot, a vane mounted in said slot for radial reciprocation therein and adapted when at its inner end to close said inlet bores, and a cylindrical rotor having an inner diameter greater than the diameter of said shaft and an outer diameter less than the inner diameter of said housing loosely mounted about said shaft within said housing with its opposite ends engaging against said wear plates, whereby upon application of air under pressure to said inlet bore said vane is forced outwardly of said slot and said rotor is forced to move about said shaft in an unbalanced condition.

2. A device as claimed in claim **1** wherein said shaft includes axial extensions at opposite ends thereof projecting through said wear plates and said end plates.

3. A device as claimed in claim **1** wherein said exhaust bore extends completely through said shaft.

4. A device as claimed in claim **1** wherein said rotor slidably and sealingly engages the wear plates at opposite ends thereof.

5. A device as claimed in claim **1** wherein said vane slidably and sealingly engages said wear plates at opposite ends thereof.

6. A device as claimed in claim **1** wherein the outer portion of said vane slidably and sealingly engages the inner face of said rotor.

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