

Sept. 28, 1926.

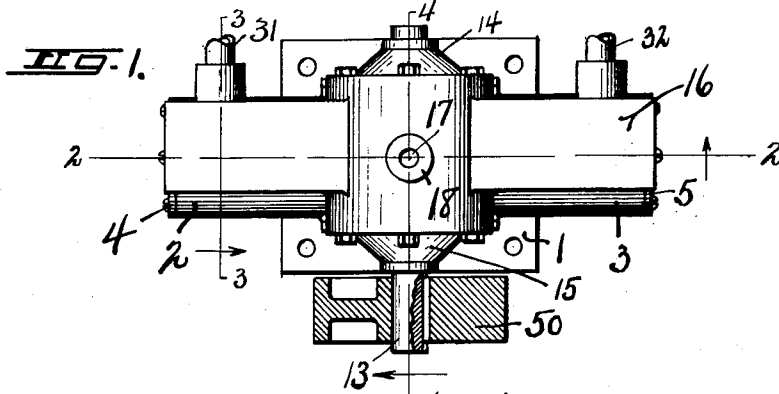
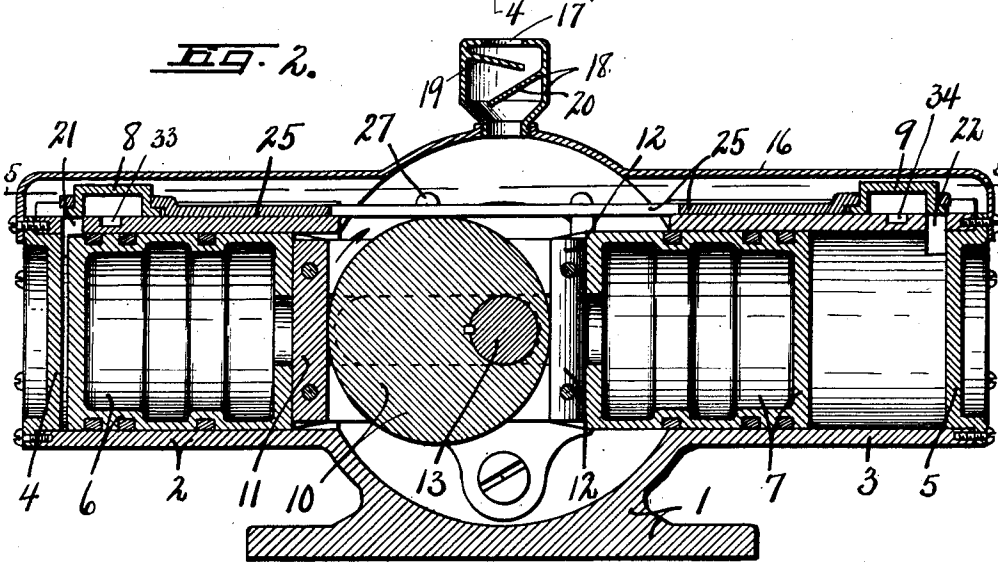
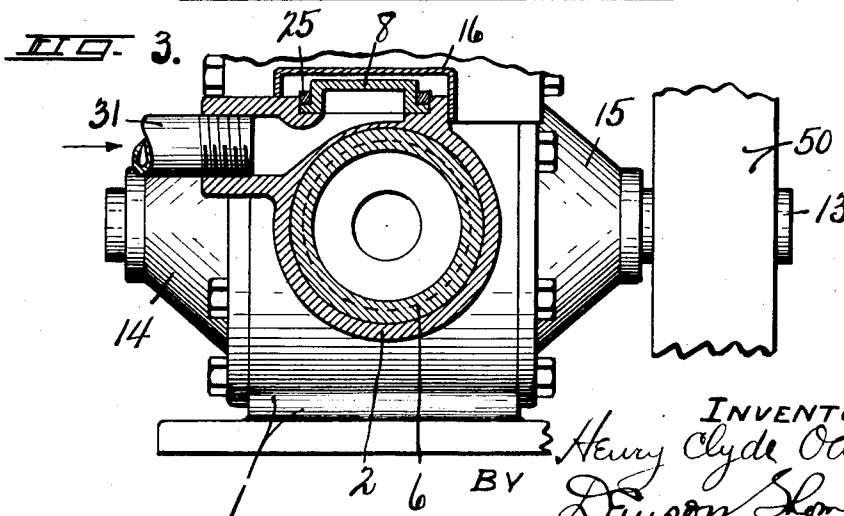
1,601,370

H. C. ODEN

VACUUM PUMP

Filed Nov. 2, 1923

3 Sheets-Sheet 1



INVENTOR
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Sept. 28 , 1926.

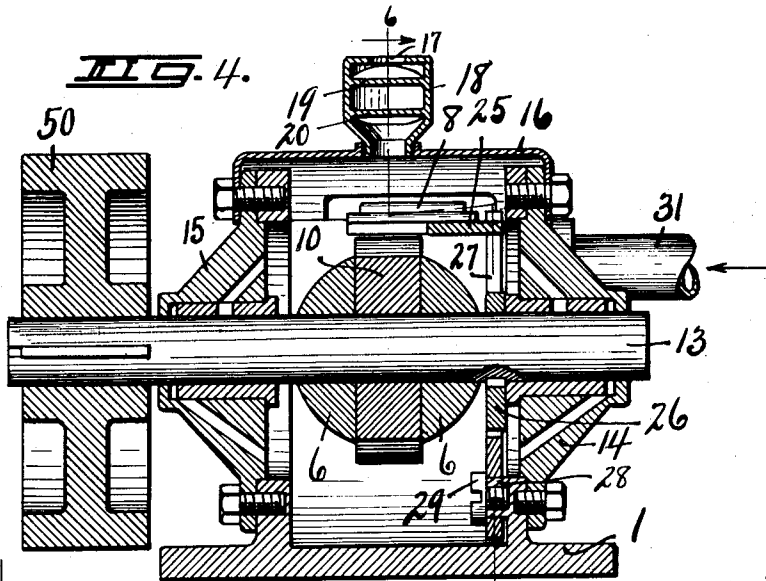
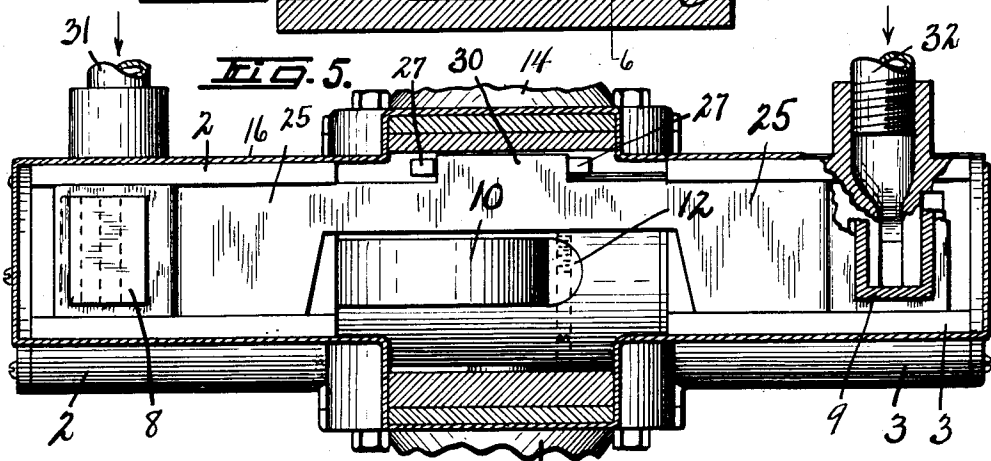
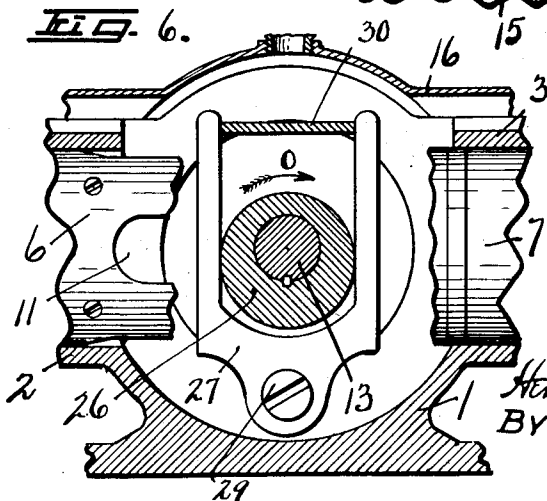
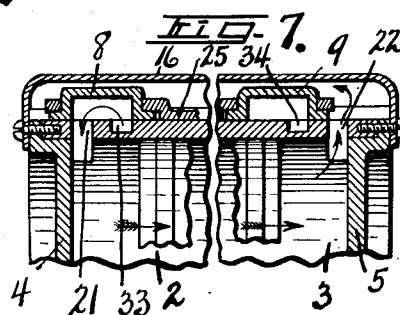
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VACUUM PUMP

Filed Nov. 2, 1923

3 Sheets-Sheet 2



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Sept. 28, 1926.

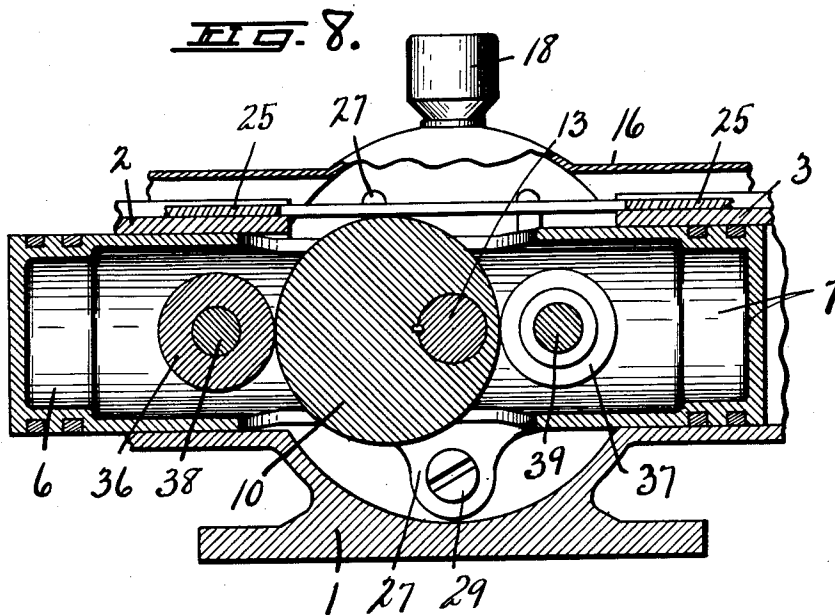
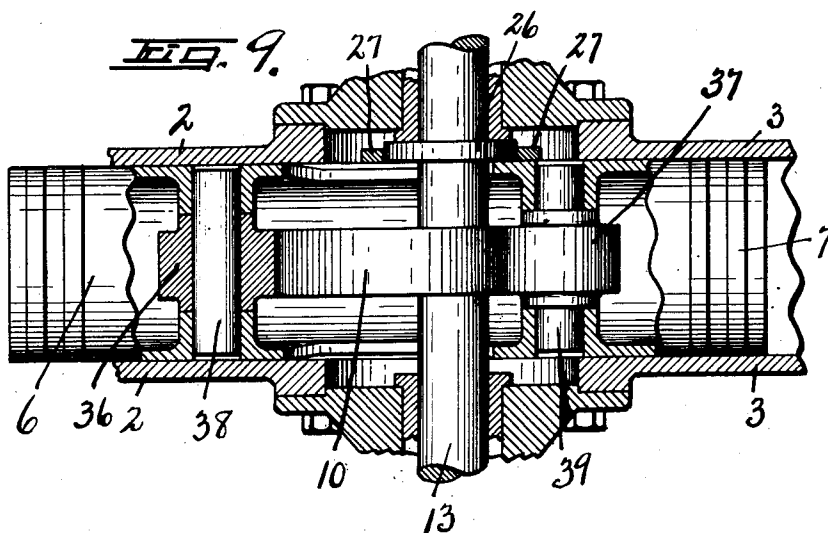
1,601,370

H. C. ODEN

VACUUM PUMP

Filed Nov. 2, 1923

3 Sheets-Sheet 3



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Patented Sept. 28, 1926.

1,601,370

UNITED STATES PATENT OFFICE.

HENRY CLYDE ODEN, OF SYRACUSE, NEW YORK, ASSIGNOR TO PINE TREE MILKING MACHINE COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

VACUUM PUMP.

Application filed November 2, 1923. Serial No. 672,310.

This invention relates to certain improvements in vacuum pumps.

The main object of the invention is to increase the efficiency of a structure of this character, and thereby reduce the cost of operation in the production of a predetermined amount of vacuum, and a main feature resides in the mechanical operation of the valves in such a manner and so timed as to permit the expulsion of all of the air from the cylinders of the structure before the vacuum-producing strokes of the respective pistons begin, thereby rendering the vacuum strokes of maximum efficiency.

A more specific object is the production of a pump of this character that can be operated at high speed, and with little expenditure of energy when in operation.

Other objects and advantages relate to the details of construction of the apparatus and parts thereof, all as will more fully appear from the following description, taken in connection with the accompanying drawings, in which:—

Figure 1 is a top plan view of the pump.

Figure 2 is a section on line 2—2, Figure 1.

Figure 3 is a section on line 3—3, Figure 1.

Figure 4 is a section on line 4—4, Figure 1.

Figure 5 is a section on line 5—5, Figure 2.

Figure 6 is a section on line 6—6, Figure 4.

Figure 7 is a partial section similar to Figure 2 illustrating the valves and their operating structure in a somewhat different position.

Figure 8 is a section similar to Figure 2 of a slightly modified form of structure.

Figure 9 is a horizontal section thru Figure 8.

The apparatus, as shown, comprises a pedestal —1— carrying a pair of oppositely-extending axially aligned cylinders —2— and —3—, which may be cast integral with the pedestal, and having cylinder heads —4— and —5— respectively secured in position in any suitable manner to close the ends of the cylinders. These cylinders are spaced apart a distance to permit the intermediate positioning of the operating apparatus for the pistons —6— and —7— and the valves —8— and —9—. The pistons

—6— and —7— may be integrally united and formed from a single cored casting, if desired, and in this illustration is so formed and is provided with a vertical slot or opening within which the operating cam —10— is adapted to be positioned for contact with the opposite walls of the slot, and preferably these walls are constituted of hardened bars —11— and —12— as shown of substantially semi-cylindrical form, and secured in semi-cylindrical recesses in the opposite ends of the vertical slot in the piston to constitute hardened wearing surfaces for frictional contact with the surface of the cam.

The operating shaft —13— extends transversely through the housing of the cylinders —2— and —3— at substantially the central portion of the structure, and is journaled in opposite conical end walls —14— and —15— connected with the pedestal —1— and the cylinders —2— and —3— to form a rigid structure open at its top, and adapted to be substantially closed by a cap or cover —16— extending throughout substantially the length of the cylinders —2— and —3— and spaced vertically from the cylinders, but connected to them to form a substantially closed structure having an air outlet —17— at the upper end of the oil separator —18— which includes baffles —19— and —20—.

It will be obvious that upon rotation of shaft —13— the cam —10— will move the pistons —6— and —7— alternately in opposite directions to produce successive vacuum and pressure in the cylinders —2— and —3—, and for the purpose of freely discharging the air from the cylinders —2— and —3— upon the compression stroke of the respective pistons ports —21— and —22— respectively are formed at the ends of the cylinders, and which communicate with the chamber within the hood or cover —16— and for the purpose of controlling these ports, valves —8— and —9— respectively are provided, and are connected by an operating bar —25— which has openings or seats in its opposite ends for the reception of the respective valve structures —8— and —9— and preferably, as shown, valve structures are of cup-shaped form and of somewhat rectangular shape, and formed with outwardly projecting edge flanges, which edge flanges constitute the valves for controlling the ports, as hereinafter described.

The valve-operating member —25— is actuated by a cam —26— keyed to the shaft —13— and positioned within a yoke, or forked member —27— pivotally mounted on boss —28— and secured in place by headed screw —29—, the upper ends of the yoke —27— engaged with the opposite edges of a flange or projection —30— on the valve operating member —25—, as best illustrated in Figure 5 so that rocking movement of the yoke —27— will move the valve-operating member —25— in opposite directions to actuate the valves and properly position them for the operation hereinafter described.

The valve-operating member —25— is free to slide upon the upper surface of the cylinders —2— and —3—, which surface is formed with a groove for receiving said member so as to guide it in its sliding movement.

The upper outer surface of the cylinders —2— and —3— are each provided adjacent the ports —21— and —22— with laterally extending channels or grooves that constitute ports which are at all times in communication with the respective pipes —31— and —32— which are connected to the space or device to be evacuated, as for instance, to the teat cups of a milking machine through the usual pulsating mechanism.

The operation of the valves —8— and —9— in connection with the other elements of the structure constitutes an essential portion of this invention in that while both the piston and the valve mechanism are actuated from shaft —13—, yet they are actuated by separate cams or other mechanism by means of which the valves travel somewhat behind the pistons, whereby the pistons are enabled to entirely force the air from the cylinders —2—, and —3— upon their pressure-producing strokes so that when they start upon their vacuum-producing stroke they immediately begin to produce vacuum, as distinguished from merely permitting the expansion of a residue of air that has been compressed in the ends of the cylinders.

As shown in Figure 2, the piston —6— has just reached the end of its pressure stroke, and the valve —8— is just arriving at the point where it completely closes the port —21— and which would prevent further escape of air from the cylinder —2—. As the piston —6— starts on its vacuum-producing stroke as actuated by cam —10—, the valve —8— continues to move toward the outer end of the cylinder until it arrives at the position shown in Figure 7, when the port —21— is completely opened and the cylinder —2— is in free communication with the groove or port —33—, which port is in turn in direct communication with the pipe line —31—.

At the time when this operation of valve —8— is taking place, and at the time when

the piston —7— starts upon its compression movement, the valve —9— is just moving inwardly to the point where it opens the port —22— shutting off communication between cylinder —3— and port —34— and discharging air from the cylinder —3— through hood or cap —16— and the separator —18— to the atmosphere. Any oil that is entrained with the air is collected by the baffles —19— and —20— and drops back into the apparatus.

The arrangement of the cams —10— and —26— is respectively like that shown in Figures 2 and 6. When the cam —10— is in the position shown in Figure 2 where the piston —6— has completed its pressure stroke, the cam —26— is substantially in the position shown in Figure 6, and where further movement of the shaft —13— will continue to shift the valve-carrying or operating member —25— in the same direction as the pressure stroke of piston —6— so as to effect the operation of the valves as heretofore described, and in which the valve —8— continues to move in the direction of the pressure stroke of piston —6— even after the piston —6— has started on its vacuum producing stroke in the opposite direction.

This arrangement and operation of the valves permits complete discharge of the air from the cylinders —2— and —3— upon the respective strokes of the respective pistons, thereby rendering the vacuum producing stroke effective during the entire stroke for producing vacuum. Further, the use of mechanically-actuated valves as the valves —8— and —9— permits a much higher speed operation of the structure than is possible with gravity-actuated valves, and is more positive in its operation and control.

For the purpose of rendering the operation of the structure of a smooth and balanced character, the pulley —50— has one side weighted so as to counter-balance the cam or eccentric —10—, as perhaps best illustrated in Figure 1, and the cam and pulley are so arranged in connection with the shaft —13— that the one balances the other.

In Figures 8 and 9 a somewhat modified form of structure is illustrated in that in place of the hardened inserts or contact members —11— or —12—, there is shown a pair of hardened rollers —36— and —37— mounted upon shafts —38— and —39— journaled in the walls of the respective pistons —6— and —7— and the cam —10— contacts with these rollers for shifting the pistons endwise as the shaft —13— rotates.

By this construction friction is considerably reduced between the cam and the parts with which it contacts if that is desired. Otherwise the structure of Figures 8 and 9 is similar in construction and operation to that disclosed in the former figures. The

rollers —36— as here illustrated, are of circular form, but it is obvious that they may be formed in the nature of eccentrics, if that is desired.

5 Altho I have shown and described specific constructions as illustrative of perhaps preferred embodiments of my invention, I do not desire to restrict myself to the details of construction, form or operation of the apparatus and the parts thereof, as various changes may be made in the details of form, construction and arrangement without departing from the invention as set forth within the appended claims.

15 I claim:

1. A vacuum pump comprising a base, a pair of cylinders carried by said base, pistons in said cylinders, a port in each cylinder wall, mechanism for simultaneously driving said pistons in opposite directions, separate valves controlling said ports, a bar engaged with each of said valves for simultaneously actuating the valves, and a hood mounted on said cylinders and constituting a common means of communication between said ports and the atmosphere.

2. A vacuum pump comprising a base, a pair of cylinders carried by said base, pistons in said cylinders, a port in each cylinder wall, mechanism for simultaneously driving said pistons in opposite directions, separate valves controlling said ports, a bar engaged with each of said valves for simultaneously actuating the valves, a cam driven from said mechanism to actuate said bar, and a hood mounted on said cylinders and constituting a common means of communication between said ports and the atmosphere.

3. A vacuum pump comprising a base, a pair of cylinders carried by said base, pistons in said cylinders, a port in each cylinder wall, mechanism for simultaneously driving said pistons in opposite directions, a bar exterior of the cylinders and slidable along the walls of the cylinders, a pair of cup-shape valves mounted respectively in the opposite ends of the bar and adapted to

control the ports in the cylinder walls, and grooves in the cylinder walls underneath said cup-shape valves constituting ports permitting communication between a pipe line and the space within the cup-shape valve at the same time that communication exists between the respective cylinder and the space within the respective cup-shape valve controlling the port of that cylinder.

4. A vacuum pump comprising a base, a pair of cylinders carried by said base, pistons in said cylinders, a port in each cylinder wall, mechanism for simultaneously driving said pistons in opposite directions, a bar exterior of the cylinders and slidable along the walls of the cylinders, a pair of cup-shape valves mounted respectively in the opposite ends of the bar and adapted to control the ports in the cylinder walls, grooves in the cylinder walls underneath said cupshape valves constituting ports permitting communication between a pipe line and the space within the cup-shape valve at the same time that communication exists between the respective cylinder and the space within the respective cup-shape valve controlling the port of that cylinder, and a hood mounted on the cylinders and constituting means of communication between the ports in the cylinders and the atmosphere when the respective valves are in predetermined position.

5. A pump comprising a base, a pair of cylinders carried by the base, pistons in the cylinders, a port in each cylinder wall, mechanism for simultaneously driving said pistons in opposite directions comprising a rotary shaft, separate valves controlling said ports, a bar engaged with said valves for simultaneously actuating them, a yoke pivoted to the base and engaged with said bar, and a cam mounted on said shaft and contacting with the yoke to tilt the same about its pivot to shift said bar and the valves engaged therewith.

In witness whereof I have hereunto set my hand this 15th day of October, 1923.

HENRY CLYDE ODEN.