Sept. 30, 1930. O. SIMMEN 1,776,933

FLUID COMPRESSOR

Filed Jan. 3, 1929 2 Sheets-Sheet 1

Fig. 1.

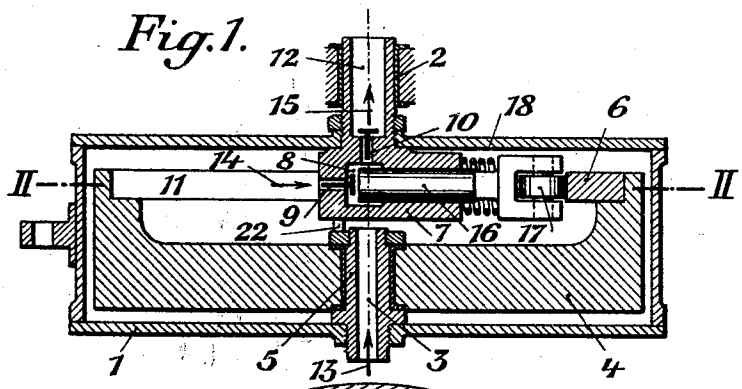
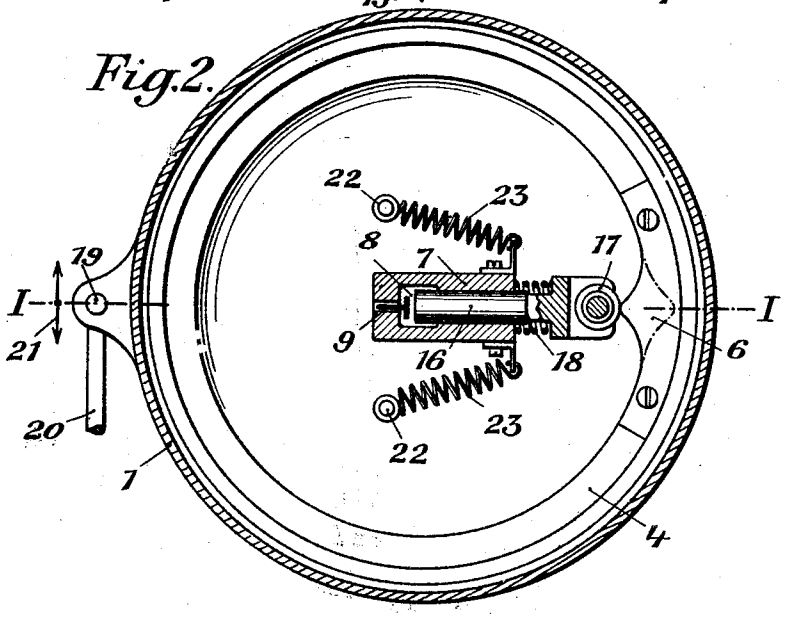


Fig. 2.



INVENTOR:
Oscar Simmen

BY
Pennie Davis Marvin & Edmonds.
ATTORNEYS

Sept. 30, 1930. O. SIMMEN 1,776,933

FLUID COMPRESSOR

Filed Jan. 3, 1929 2 Sheets-Sheet 2

Fig.3.

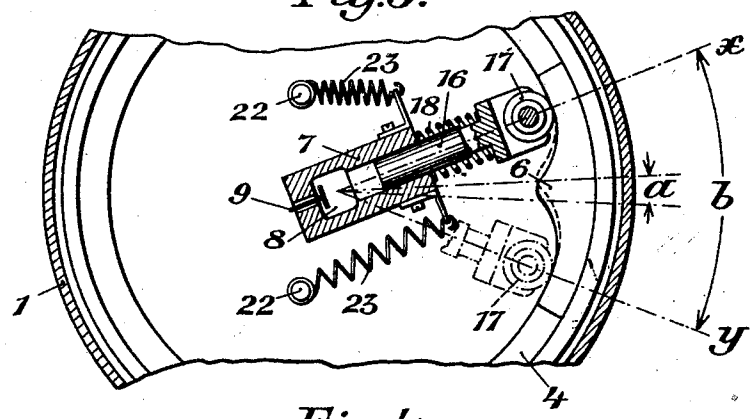


Fig.4.

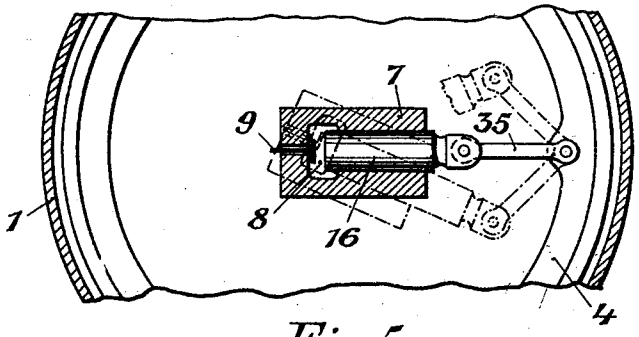
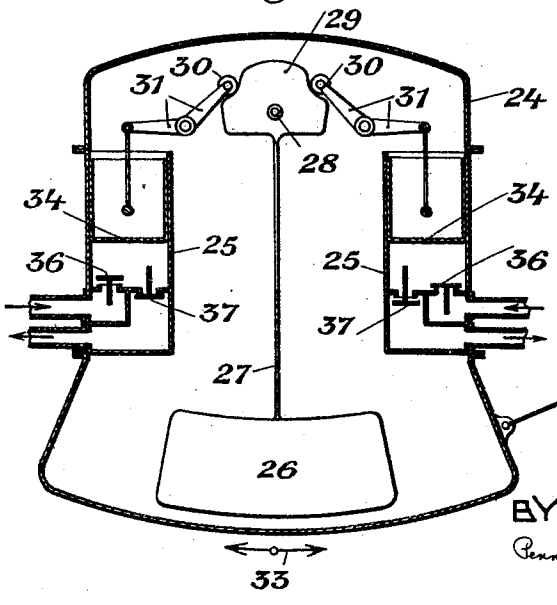


Fig.5.



INVENTOR:
Oscar Simmen
BY
Pennie Davis Marvin & Edmonds
ATTORNEYS

Patented Sept. 30, 1930

1,776,933

UNITED STATES PATENT OFFICE

OSCAR SIMMEN, OF ERLACH, SWITZERLAND, ASSIGNOR TO THE FIRM SULZER FRÈRES SOCIÉTÉ ANONYME, OF WINTERTHUR, SWITZERLAND

FLUID COMPRESSOR

Application filed January 3, 1929, Serial No. 330,077, and in Switzerland January 31, 1928.

This invention relates to fluid compressors of the piston type and more particularly those intended for use in small refrigerating machines.

A fluid compressor according to this invention comprises a casing adapted to receive movement at varying velocity, such as pendulum movement, and an inertia mass so mounted within the casing as not to participate or to participate only partially in this movement, the relative movement between the casing and the inertia mass being converted not directly, but indirectly into the working stroke of the compressor piston or pistons.

Preferably each cylinder of the compressor is secured to the casing so as to participate in the movement thereof, the inertia mass being arranged within the casing so as to act on each piston in accordance with the relative movement between the casing and the inertia mass. Conveniently the relative movement between the casing and the inertia mass is transmitted to each piston by means of a cam mounted on the inertia mass and acting upon the piston which is held in engagement with the cam surface by means of a return spring or the like.

Thus the point on the inertia mass which transmits the working movement to the piston is moved during the transmission of work chiefly transversely to the direction of movement of the piston or other member receiving the working movement. With this arrangement the cylinder takes part in the movement of the casing so that only the inertia mass is exposed to any accidental irregularities in relative movement, whilst the piston stroke, being dependent on the movement of a cam surface, is relieved from any such irregularities.

Alternatively the piston may be connected to the inertia member as by means of a connecting rod, this arrangement having the advantage that the necessity for a return spring on the piston is obviated.

Two alternative constructions of fluid compressor according to this invention together with some modifications are illustrated by way of example in the accompanying drawings, in which

Figure 1 is a sectional elevation on the line I—I of Figure 2,

Figure 2 is a plan on the line II—II of Figure 1,

Figure 3 is a similar view showing the compressor at the end of a suction stroke,

Figure 4 shows a modified construction, and

Figure 5 is an alternative construction.

Referring to Figures 1–3, 1 is the compressor casing mounted in a bearing 2 so as to be capable of swinging or oscillating about the axis 3, and 4 is an inertia member which is mounted on a hollow spindle 5 and to which is secured a cam 6. Within the casing 1 and rigidly secured to it is a compressor cylinder 7, the pressure or delivery chamber 8 of which is connected through a suction valve 9 to the suction chamber 11 and through a delivery valve 10 to the delivery branch 12. The compressor thus draws fluid in in the direction indicated by the arrows 13 and 14, and delivers in the direction of the arrow 15.

The piston 16 which is provided at its outer end with a roller 17 is pressed outwards by the spring 18. The pivot pin 19 transmits to the casing 1 the oscillating movement effected by means of a connecting rod 20 in the direction of the double arrow 21. The inertia member 4 is provided with two studs 22 which are so connected by means of springs 23 to the casing 1 that the cam 6 is forced into the central position as shown in Figure 2. The operation of the compressor is then as follows.

During the working a pendulum motion is transmitted to the casing 1 and thus to the compressor cylinder 7, the freely mounted inertia mass 4 taking part in this motion only with distortion. The mass 4 owing to its inertia and under the action of the springs 23 will oscillate lightly about the central position shown in Figure 2 and will describe the arc indicated by a in Figure 3, the casing 1 with the compressor cylinder 7 will describe the arc indicated by b, so that the compressor cylinder 7 will be moved to and fro between the end positions x and y shown in Figure 3. Consequently the piston 16 will be moved up and down in the cylinder 7 and will perform compressor work.

Thus the delivery stroke of the compressor

is exactly determined without being limited by stops and the only accidental movement is that of the inertia mass 4. The arc *b* is, however, calculated in such a manner as to ensure that the piston 16 of the compressor can in any case travel through the prescribed stroke. The cam may be either of symmetrical or unsymmetrical form and may have a surface as shown in chain lines in Figure 2, this having the advantage that when the compressor is in its central position it is maintained in the state of stable equilibrium and further that the starting of the compressor is facilitated as in such a case the cam is forced into the central position not only by the springs 23 but also by the working reaction, whilst in the case of a positively constructed cam the working reaction has the tendency to push the cam out of the central position.

In the modified construction shown in Figure 4, a rod 35 is used in place of a cam. In those constructions in which a cam is employed both the upper and the lower dead centre positions of the compressor or of the compressors are exactly determined but when rods are employed only the upper dead centre position is exactly determined, whilst the lower dead centre position depends on the amplitude of the relative deflections between the inertia mass and the casing which however, in most cases is only of secondary importance.

In the construction shown in Figure 5, two compressor cylinders 25 are mounted in the casing 24. The inertia mass 26 in the form of a pendulum bob is mounted by means of a rod 27 pivoted at the centre of rotation 28 of the compressor and the cam 29 connected to the rod 27 acts on rollers 30 of double-armed levers 31 to which the piston rods are secured. When an oscillatory movement is transmitted to the compressor casing 24 by the rod 32 in the direction of the double arrow 33 the inertia mass 26 and the cam 29 will not take part in the said movement, or will take part in it only to a limited extent so that the rollers 30 and the transmission levers 31 will by reason of their movement relatively to the cam, transmit the working movement to the two pistons 34. The fluid to be delivered will then be drawn in through the suction valves 36 and expelled through the delivery valves 37. With this arrangement the compressor when in its central position will be maintained in a state of stable equilibrium, starting of the compressor being thereby facilitated as above set forth.

The indirect transmission of the working movement of the pistons by means of cams or rods has the advantage of making it possible without the use of stop devices to maintain exactly the upper and in some cases also the lower dead centre position of the compressor piston.

I claim:

1. In a fluid compressor of the piston type the combination with a swingable casing of a piston compressor being in a fixed connection to the casing, an inertia mass yieldingly arranged within the casing and a cam mounted on the inertia mass for transmitting the relative movement between the casing and the inertia mass to the driving parts of the piston compressor.

2. In a fluid compressor of the piston type the combination with a swingable casing of a piston compressor having a number of cylinders and being in a fixed connection to the casing, an inertia mass yieldingly arranged within the casing and a number of cams mounted on the inertia mass and each transmitting the relative movement between the casing and the inertia mass to the piston of a compressor cylinder.

3. In a fluid compressor of the piston type the combination with a swingable casing of a piston compressor having a number of cylinders and being in a fixed connection to the casing, an inertia mass yieldingly arranged within the casing and a number of cams mounted on the inertia mass and each transmitting the relative movement between the casing and the inertia mass to the piston of a compressor cylinder, the central part of the cams being so formed that stable equilibrium of the inertia member corresponds to the central position of the compressor.

4. In a fluid compressor of the piston type, the combination with a swingable casing of a piston compressor, an inertia mass in the form of a pendulum bob arranged to swing relatively about the center of oscillation of the casing and to participate only partially in the swinging of said casing, and means for transmitting the relative movement between the casing and the inertia mass to the driving parts of the piston compressor.

In testimony whereof I have affixed my signature.

OSCAR SIMMEN.