

UNITED STATES PATENT OFFICE

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COMPRESSOR

Application filed March 19, 1930. Serial No. 437,238.

This invention relates to compressors and more particularly to a novel construction thereof tending to simplify, render more efficient and improve the same generally.

Compressors are sometimes requested for special applications, as for instance for starting airplane motors, which must be small in dimensions, light in weight, and must supply a small quantity of fluid compressed to high pressure.

To comply with these requirements, my invention provides means operating at high velocity to give a first compression to the fluid (which usually is air) and means operating at lower speeds for further compressing said fluid to higher degrees of compression. In the case of a multi-cylinder compressor in which the fluid is compressed through several compression steps, degrees or stages, and each successive degree of compression is obtained in one cylinder only or in a group of collaborating cylinders, in accordance with my invention the speed of the operative parts of each cylinder or group of cylinders can be made inversely proportional to the degree of compression reached in said cylinder or group of cylinders; this results in the fluid being compressed in each cylinder or group of cylinders at a speed approximately inversely proportional to its density. By this arrangement even if the volume of compressed fluid required for the particular case is very small, the size of the highest stage compressing means may be kept of reasonably large size owing to the low operating speed, the said large size being very advantageous for construction purposes and for dissipating the heat generated by high compression. On the other hand, for the first stages, wherein the fluid has large volume and is cooler, the compressing means operates at high speed and can therefore be of smaller proportions, which is beneficial for the lightness of the compressor.

Another advantage of my invention is that the compressor shafts operating at different speeds can readily be used for power take-offs. For instance, if the compressor is used for supplying compressed fluid to start internal combustion engines, a fluid distributor

can be driven at proper speed and timing by one of the compressor shafts and other accessories as for instance a timer, or an oil or water pump, can be driven by other shaft ends.

The several objects, advantages and novel details of construction of one embodiment of my invention will be made more apparent as this description proceeds, especially when considered in connection with the accompanying drawing, wherein

Figure 1 is a semi-diagrammatical vertical sectional view through a compressor constructed in accordance with my invention, and

Figure 2 is a semi-diagrammatical horizontal sectional view taken substantially on the plane indicated by line 2—2 in Figure 1.

It should be understood that while in the form herein illustrated the compressor consists of two cylinders only, corresponding to first and second stages of compression, compressors may be readily designed which would fall within the scope of this invention and which would employ a greater number of cylinders and a greater number of stages, each stage consisting of one cylinder only or a group of cylinders.

The form of the invention herein illustrated and referred to, is particularly designed to be driven directly by an internal combustion engine, and includes a fluid distributor for starting purposes.

Referring now more particularly to the drawing wherein like reference characters indicate like parts, it will be noted that the reference character 1 indicates the shaft of the first stage cylinder and 2 the shaft of the second stage cylinder. A piston 3 is arranged in the first stage cylinder and a piston 4 in the second stage cylinder, indicated respectively by the reference characters 5 and 6. The reference character 7 indicates the intake valve and 8 the outlet valve of the first stage cylinder, and the reference characters 9 and 10 indicate respectively, the intake and outlet valves of the second stage cylinder.

The reference character 11 indicates the compressed fluid line from the first cylinder

to a receptacle 23, and the reference character 12 indicates the compressed fluid line from this receptacle to the second cylinder 6. The outlet line for the compressed fluid from the second cylinder is indicated by the reference character 13.

The reference character 14 indicates the compressor body in which gears 15 and 16, and shafts 1 and 2 are arranged. The gear 15 is keyed or otherwise fixed to shaft 1 and the gear 16 is similarly fixed to shaft 2. The ratio of gears 15 and 16 is such that shaft 2 is driven at half the speed of shaft 1.

The reference character 17 indicates a fluid distributor, for which no claim is made in the present application. The reference character 18 indicates a compressed fluid receptacle and 19 the rotary part of the distributor which may be conveniently driven by shaft 2 as indicated in Figure 2. The reference characters 20 and 21 indicate ports in the rotary and stationary parts respectively of the distributor which deliver the compressed fluid to a means active in the starting of the engine. The compressed fluid is supplied to the distributor through port 22 connected in any suitable manner to, for instance, the conduit 13.

The receptacle 23 interposed between the first and second stage cylinders, serves the purposes of cooling the fluid between the first and second stages and compensates for variations in pressure in the ports or conduits 11 and 12 due to the different operating speeds of pistons 3 and 4.

When the shaft 1 is driven, as for instance by the engine, air is sucked past valve 7 into the first cylinder indicated by the reference character 5 and after compression the said fluid is forced through valve 8 and conduit 11 into receptacle 23. From this receptacle it passes through conduit 12 and valve 9 into the second stage cylinder 6 where it undergoes the second compression and is finally delivered through valve 10 to conduit 13.

What I claim as my invention is:

1. In a combination, means for compressing fluid through a plurality of stages, and means for driving said compressing means at a speed inversely proportional to the compression reached in each stage.

2. In a fluid compressor, means for compressing fluid to gradually higher densities, and interconnected means for driving said compressing means at speeds inversely proportional to the density of the fluid on which said compressing means operate.

3. In a fluid compressor, a plurality of cylinders and pistons for compressing said fluid, a plurality of shafts corresponding to said cylinders, means for driving said shafts at different speeds one from the other, said speeds being inversely proportional to the degree of compression reached by the fluid in said cylinders.

4. In a fluid compressor, a plurality of compressing means, a plurality of driving means corresponding to said compressing means said driving means being mechanically interconnected and operating at speeds inversely proportional to the degree of compression reached by the fluid in correspondence with said compressing means.

5. In a fluid compressor, cylinders and pistons for compressing said fluid, shafts corresponding to said cylinders, and means connecting said shafts for driving said pistons at speeds inversely proportional to the degree of compression reached in the corresponding cylinders.

6. In means for starting internal combustion engines by compressed fluid, means for compressing fluid to higher densities, and means interconnecting and driving said compressing means at speeds inversely proportional to the density of the fluid on which said compressing means operate.

7. In means for starting internal combustion engines by compressed fluid, a plurality of cylinders and pistons for compressing said fluid, a plurality of shafts corresponding to said cylinders, and means for driving said shafts at speeds inversely proportional to the degree of compression reached in the corresponding cylinders.

8. In a fluid compressor, a plurality of fluid compressing means, means driving said compressing means at speeds inversely proportional to the degree of compression reached by the fluid in correspondence with said compressing means, and a fluid receptacle between said compressing means.

9. In a fluid compressor, a plurality of compressing means, a plurality of shafts driving said compressing means, and means interconnecting and driving said shafts at speeds inversely proportional to the degree of compression reached by said fluid in correspondence with said compressing means.

In testimony whereof I affix my signature.
MICHELE A. CASERTA.