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FLUID ENERGY MACHINE

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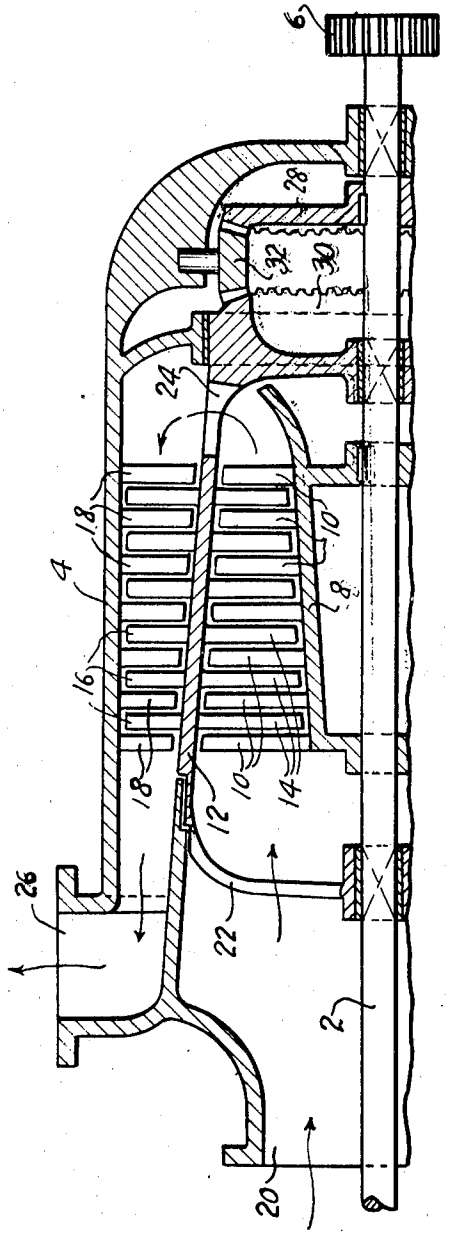

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FLUID ENERGY MACHINE

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3 Claims. (Cl. 230—123)

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This invention relates to fluid energy machines and especially to air compressors and the like.

It is an object of this invention to provide a fluid compressor which takes up a minimum of space, has a minimum weight, and yet operates efficiently. This is accomplished in a rotary axial flow compressor having two pairs of blade or bucket sets. Each pair of bucket sets provides an annular passage for the flow of fluid in the axial direction. One pair of bucket sets completely surrounds the other and communicates with it.

The sole figure of the drawing is a partial view in section of a fluid energy machine made according to the invention. In this figure the shaft 2 is journaled in the main casing and support 4. Shaft 2 may be driven from any suitable power source either directly or through a gear 6. A drum 8 is keyed to shaft 2 for rotation therewith, and supports a set of rows of buckets or blades 10. An intermediate drum 12 is mounted for rotation relatively to shaft 2, and serves to support a set of inwardly extending buckets 14 and the set of outwardly extending buckets 16. The casing 4 serves to support a set of inwardly extending buckets 18.

Buckets 14 and 16 are supported on the intermedate drum 12 which serves as a septum or dividing wall between these two sets of buckets. As will be well understood by those skilled in the art, buckets 10 and 14 cooperate to compress elastic fluid as it progresses from one row of buckets to the next. Similarly, buckets 16 and 18 cooperate. Fluid to be compressed enters the machine at 20, passes through openings, one of which is shown at 22, in the left end of the intermediate drum, passes through other openings, such as is indicated at 24, near the other end of the intermediate drum, and leaves the machine through outlet 26.

A bevel gear 28 is keyed to shaft 2 to drive bevel gear 30 on the end of intermediate drum 12. This drive, is accomplished through one or more idler gears 32, which serve to rotate drum 12 in the opposite direction from the direction of rotation of shaft 2 and gear 28.

As shown here gears 28 and 30 have the same diameter.

Operation

In operation shaft 2 may be driven by a gas turbine or other suitable power source and rotates drum 8 with it. Intermediate drum 12 is driven at an equal and opposite speed through the gear arrangement shown. Air or other fluid

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enters the machine at inlet 20 and is compressed in stages as it passes from left to right through alternate rows of blades 10 and 14. The air so compressed passes through openings 24 in drum 12, reverses direction and is further compressed as it progresses axially between alternate rows of blades 16 and 18, leaving the machine at outlet 26.

We claim:

1. A rotary gaseous multiple stage compressor comprising inner and outer concentrically arranged compressor sections of substantially equal length, a drive shaft, means driving said shaft, an inner drum mounted on said shaft and directly driven thereby and carrying a plurality of equally axially spaced outwardly radially projecting buckets, an intermediate drum rotatably supported on said shaft and driven thereby by gearing in the opposite direction to the crankshaft rotation, said intermediate drum enclosing said inner drum and provided with radially inwardly extending equally axially spaced buckets cooperating with the buckets carried by said inner drum, said intermediate drum further provided with radially outwardly extending equally axially spaced buckets, and an outer casing carrying means supporting said drum shaft and gearing and enclosing both said inner and intermediate drums and cooperating with said intermediate drum to provide a fluid passage, said casing provided with radially inwardly extending equally axially spaced buckets cooperating with the radially outwardly extending buckets carried by said intermediate drum, said casing having gaseous fluid inlet and outlet ports adjacent one end, said inner and outer compressor passages being uniformly progressively converging in the direction of the fluid flow, the buckets at the outlet of said inner compressor section and the buckets at the inlet of said outer compressor section being substantially the same radial dimension.

2. A rotary gaseous multiple stage compressor comprising inner and outer concentrically arranged compressor sections of substantially equal length, a drive shaft, means driving said shaft, an inner drum mounted on said shaft and directly driven thereby and carrying a plurality of equally axially spaced outwardly radially projecting buckets, an intermediate drum rotatably supported on said shaft and driven thereby by gearing in the opposite direction to the crankshaft rotation, said intermediate drum enclosing said inner drum and provided with radially inwardly extending equally axially spaced buckets cooper-

ating with the buckets carried by said inner drum, said intermediate drum further provided with radially outwardly extending equally axially spaced buckets, and an outer casing carrying means supporting said drive shaft and gearing and enclosing both said inner and intermediate drums and cooperating with said intermediate drum to provide a fluid passage, said casing provided with radially inwardly extending equally axially spaced buckets cooperating with the radially outwardly extending buckets carried by said intermediate drum, said casing having gaseous fluid inlet and outlet ports adjacent one end, said inner and outer compressor passages being uniformly progressively converging in the direction of the fluid flow, the buckets at the outlet of said inner compressor section and the buckets at the inlet of said outer compressor section being substantially the same radial dimension, said intermediate drum provided with an inlet at one end communicating with the casing inlet and with opening at the other end serving a transfer passage connecting the discharge end of said inner compressor section with the inlet end of said outer compressor section, said intermediate drum providing an end wall forming the end of said inner compressor section.

3. A rotary gaseous multiple stage compressor comprising inner and outer concentrically arranged compressor sections of substantially equal length, a drive shaft, means driving said shaft, an inner drum mounted on said shaft and directly driven thereby and carrying a plurality of equally axially spaced outwardly radially projecting buckets, an intermediate drum rotatably supported on said shaft and driven thereby by gearing in the opposite direction to the crankshaft rotation, said intermediate drum enclosing said inner drum and provided with radially inwardly extending equally axially spaced buckets cooperating with the buckets carried by said inner drum, said intermediate drum further provided with radially outwardly extending equally axially spaced buckets, and an outer casing carrying means supporting said drive shaft and gearing and enclosing both said inner and intermediate drums and cooperating with said intermediate drum to provide a fluid passage, said casing being provided with radially inwardly extending equally axially spaced buckets cooperating with the radially outwardly extending buckets carried by said intermediate drum, said casing having gaseous fluid inlet and outlet ports adjacent one end, said inner and outer compressor passages being uniformly progressively converging in the direction of the fluid flow, the buckets at the outlet of said inner compressor section and the buckets at the inlet of said outer compressor section being substantially the same radial dimension, said inner drum having a radially outwardly flared extension terminating close to the end wall of the intermediate drum and coacting therewith to direct the fluid discharged from said inner compressor towards the transfer passage aforesaid in said intermediate drum.

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