

Aug. 6, 1957

H. WALTER
ROTARY COMPRESSOR
Filed July 14, 1953

2,801,791

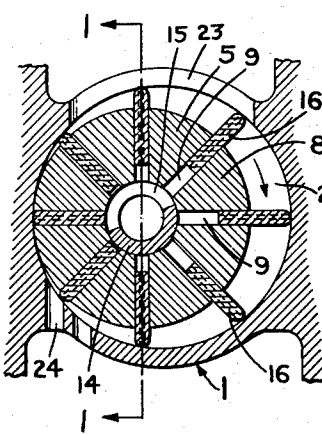


FIG. 2

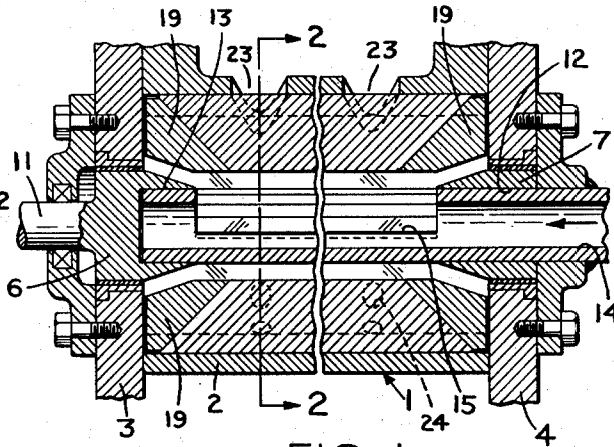


FIG. 1

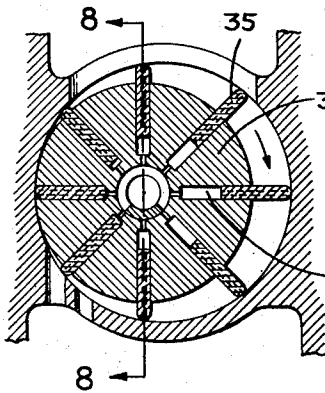


FIG. 9

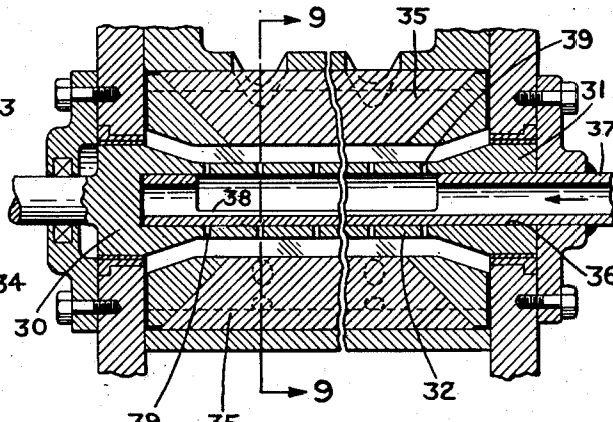


FIG. 8



FIG. 4

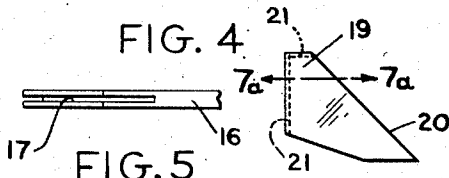


FIG. 5

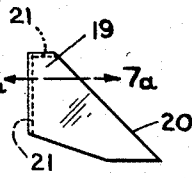


FIG. 6

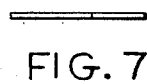


FIG. 7

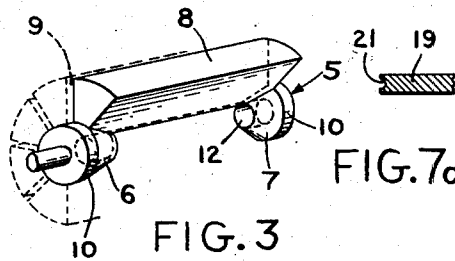


FIG. 3

FIG. 7a

HELLMUTH WALTER
INVENTOR.

BY *Robert Meyer*
att.

1

2,801,791

ROTARY COMPRESSOR

Hellmuth Walter, Upper Montclair, N. J., assignor to
Worthington Corporation, Harrison, N. J., a corpora-
tion of Delaware

Application July 14, 1953, Serial No. 367,860

4 Claims. (Cl. 230—152)

This invention relates to rotary fluid compressors embodying a rotor carrying sliding vane which rotates in an off-center or eccentric cylinder to compress the fluid, and more particularly to multi-stage compressors of this type which are substantially flooded with oil to provide lubrication of the compressor, maintenance of the compression temperature within desired limits and below the flash point of lubricating oil to eliminate oil breakdown and carbonization as well as reducing the compression temperature to permit the maintaining of the temperature of the discharged compressed fluid within a desirable range and also to provide an efficient seal between the walls of the cylinder and the sliding vanes to provide high efficiency of such compressors.

More specifically, the present invention relates to a rotary compressor of the type specified embodying novel features of construction to provide for the ingress into and distribution of oil in the compressor so as to insure proper distribution of the oil throughout the compressor and the efficient formation of fluid tight seals between the outer edges of the vanes and the cylinder walls and between the ends of the vanes and the ends of the walls.

With these and other objects in view, as may appear from the accompanying specification, the invention consists of various features of construction and combination of parts, which will be first described in connection with the accompanying drawings, showing a rotary compressor of a preferred form embodying the invention, and the features forming the invention will be specifically pointed out in the claims.

In the drawings:

Figure 1 is a longitudinal section through the compressor constructed in accordance with the present invention and taken on the line 1—1 of Figure 2.

Figure 2 is a cross-section through the compressor taken on the line 2—2 of Figure 1.

Figure 3 is a fragmentary perspective view of the rotor.

Figure 4 is a fragmentary side elevation of one of the sliding vanes.

Figure 5 is a fragmentary edge elevation of one of the sliding vanes.

Figure 6 is an elevation of a sealing blade slidably carried by the sliding vanes.

Figure 7 is an edge elevation of the sealing blades.

Fig. 7a is a cross-section through the sealing blade taken on the line 7a—7a of Figure 6.

Figure 8 is a longitudinal section through a modified form of the rotary compressor and taken on the line 8—8 of Figure 9.

Figure 9 is a cross section through the modified form of the compressor and taken on the line 9—9 of Figure 8.

Referring more particularly to the drawings the improved type rotary compressor comprises a cylinder 1, which is composed of the central cylinder wall forming section 2 and end sections 3 and 4 which are detachably connected in any suitable manner (not shown) so as to permit assembly of the compressor.

A rotor 5 is eccentrically mounted in the cylinder 1

2

and rotates therein. The rotor 5 comprises spaced hub sections 6 and 7 which are substantially frusto-conical in shape decreasing in cross sectional area towards their inner facing ends as clearly shown in Figures 2 and 3 of the drawings. The main body of the rotor is provided by a plurality of circumferentially spaced substantially frusto-perimetrical elements 8 which are attached to or formed upon the hub sections 6 and 7 and extend from one hub section to the other. The elements 8 are spaced to provide a plurality of radial slots 9 which extend the full length of the rotor and open into the space between the inner ends of the hub sections 6 and 7. The hub sections 6 and 7 each comprises flat surfaced circular portions 10 which are rotatably mounted in the end sections 3 and 4 of the cylinder 1. The hub section 6 has a shaft extension 11 thereon to which any suitable prime mover (not shown) is connected for rotating the rotor.

The hub section 7 is provided with an axial bore 12 which has axial alignment with an axial recess 13 formed in the inner end of the hub section 6. A lubricating oil conduit 14 extends into the cylinder 1 through the hub section 7 and has its inner ends seated in the axial recess 13 formed in the hub section 6. The oil conduit 14 has a large portion thereof cut away equal in length to substantially the distance between the inner facing ends of the hub sections 6 and 7 as shown at 15. This cut away portion 15 communicates with a plurality of the slots 9 at one time and has communication with all of the slots during one complete rotation of the rotor.

Vanes 16 are slidably mounted in the slots 9 and have edgewise engagement with the inner wall of the cylinder 2. The vanes 16 have slots 17 cut in their outer ends. The inner edges of the slots 17 are cut at an angle to the plane bisecting the longitudinal axis of the rotor and inclined inwardly and downwardly from the outer edges of the vanes to their inner edges as clearly shown in Figures 1 and 4 of the drawings.

Sealing blades 19 are slidably mounted in the slots 17 and they have their inner edges 20 cut at an incline to conform to the inclination of the inner edges of the slots. If it is so desired the sealing blades 19 may have recesses 21 in their outer radial ends and in their upper longitudinal edges so that the portions of the sealing blades which face the ends of the cylinder 1 and the inner wall of the cylinder 1 will be provided with oil-retaining recesses or grooves to form a complete seal between the plates and the blades and the cylinder.

Oil under suitable pressure enters the compressor through the conduit 14 from any suitable supply source of oil (not shown).

In operation, as the rotor 5 rotates in the cylinder the centrifugal force of such rotation forces the vane 16 outwardly so that their outer edges engage the inner wall of the cylinder 1 as clearly shown in Figure 2 of the drawings. The degree of extension of the vanes 16 from the perimeter of the rotor is compressed by the degree of offset between the axes of the rotor and the cylinder, as is ordinary in rotary compressors and pumps of this type. The protruding vanes form compression pockets 22 into which fluid to be compressed is drawn through the inlet 23 of the compressor. As the rotor rotates the cross-sectional area of these pockets is reduced resulting in a compression of the fluid which is finally discharged through the discharge outlets 24 of the compressor. The oil which enters the cylinder under a predetermined pressure under the conduit 14 flows out through the cutaway portion 15 of the conduit and into the slots 9 behind the inner edges of the vanes 16. It leaks past the sides of the vanes out into the compression spaces and along the edges of the sealing blades 19 which are forced outwardly by the centrifugal action caused by rotation of the rotor and thus not only are all of the sliding surfaces or fric-

tion providing surfaces of the rotor and the cylinder thoroughly lubricated but an oil seal is formed between the engaging portions of the vanes 16 and blades 19 with the portions of the cylinder walls with which they engage thus materially increasing the efficiency of compressors of this type.

Figures 8 and 9 show a modified form of the compressor wherein the hub sections 30 and 31 of the rotor are connected by a hollow shaft or cylinder connection 32 which is an integral part with the main body 33 of the rotor. The rotor is provided with a plurality of radiating slots 34 which correspond to the slots 9 and which extend inwardly to the outer surface of the connecting portion 32. The vanes 35 are slidably mounted in the slots 34 and they are of the same construction as the vanes 16. The central core of the rotor comprising the hub sections 30 and 31 and the connecting section 32 are provided with an axial longitudinally-extending recess 36 into which extends an oil conduit 37. The oil conduit 37 is cut away to provide a relatively large longitudinally extending cutout portion 38 which extends the major portion of the length of the vanes 35. The connecting core portion 32 is provided with a plurality of longitudinally spaced radially-extending openings 39 which communicate with the cutout portion 38 and with the slots 34 so that oil under pressure may be forced from the conduit 37 through the opening 38 and the openings 39 into the slots 34 at various points along the length of the slots to provide for complete flooding of the movable surfaces of the vanes and the inner wall of the cylinder.

In certain instances, compressors with relatively short life, such as those used for cooling and compressing the products of combustion of a torpedo propulsion engine, sea water may be used as a coolant and lubricant instead of oil, thus enabling simultaneous condensation of the steam or vapor portion and compression of the non-condensable portion of the fluid acted upon. Such use provides material improvement of the cycle as applied for torpedo propulsion because constant, low back pressure could be applied independent of depth. The cycle efficiency will be increased and the power developed by the engine will remain approximately constant.

It will be understood that the invention is not to be limited to the specific construction or arrangement of parts shown, but that they may be widely modified within the invention defined by the claims.

What is claimed is:

1. In a rotary compressor, a cylinder, a rotor eccentrically mounted in said cylinder, said rotor comprising spaced substantially frusto-conical hub elements, a plurality of substantially frusto-perimetrical elements attached to said hub elements and extending from one to the other of the hub elements in radial spaced relation to form vane receiving slots, vanes slidably mounted in said slots, a lubricating conduit extending through one of said hub elements and having its inner end seated in the other hub element, said conduit provided with a cut away portion having communication with said slots whereby lubricant may flow from the conduit into the slots, said vanes having slots cut in their ends, and sealing blades slidably mounted in the slots in the ends of said vanes.

2. In a rotary compressor, a cylinder, a rotor eccentrically mounted in said cylinder, said rotor comprising spaced substantially frusto-conical hub elements, a plurality of substantially frusto-perimetrical elements attached to said hub elements and extending from one to the other of the hub elements in radial spaced relation to form vane receiving slots, vanes slidably mounted in said slots, a

lubricating conduit extending through one of said hub elements and having its inner end seated in the other hub element, said conduit provided with a cut away portion having communication with said slots whereby lubricant may flow from the conduit into the slots, said vanes having slots cut in their ends, the inner ends of the slots in said vanes being cut at an acute angle to the edges of the vanes and inclining outwardly from the inner edges of the vanes, and sealing blades slidably mounted in the slots in the ends of said vanes and having their inner end cut at an angle to conform to the angled inner ends of the slots.

3. In a rotary compressor, a cylinder, a rotor eccentrically mounted in said cylinder, said rotor comprising spaced substantially frusto-conical hub elements, a plurality of substantially frusto-perimetrical elements attached to said hub elements and extending from one to the other of the hub elements in radial spaced relation to form vane receiving slots, vanes slidably mounted in said slots, a lubricating conduit extending through one of said hub elements and having its inner end seated in the other hub element, said conduit provided with a cut away portion having communication with said slots whereby lubricant may flow from the conduit into the slots, said vanes having slots cut in their ends, the inner ends of the slots in said vanes being cut at an acute angle to the edges of the vanes and inclining outwardly from the inner edges of the vanes, and sealing blades slidably mounted in the slots in the ends of said vanes and having their inner end cut at an angle to conform to the angled inner ends of the slots, the edge portions of said sliding vanes facing the walls of said cylinder being provided with oil receiving grooves.

4. In a rotary compressor, a cylinder, a rotor eccentrically mounted in said cylinder, said rotor comprising spaced substantially frusto-conical hub elements, a plurality of substantially frusto-perimetrical elements having their inner surfaces at their ends cut at angles to fit the outer surfaces of the hub elements and attached at their angled ends to the hub elements, said substantially frusto-perimetrical elements being spaced radially about the hub elements to form vane receiving slots, vanes slidably mounted in said slots, one of said hub elements having an axial bore and the other hub element provided with an axial recess extending inwardly thereinto from its inner end, a lubricating conduit extending through said axial bore in said hub element and into said axial recess, said conduit provided with a cutout portion having intermittent communication with a plurality of said slots to feed lubricant to said vanes.

References Cited in the file of this patent

UNITED STATES PATENTS

1,582,922	Freud	May 4, 1926
1,635,006	Oliver	July 5, 1927
1,964,492	Yandell	June 26, 1934
2,050,533	Huff	Aug. 11, 1936
2,324,903	Beckman	July 20, 1943
2,400,286	Buckbee	May 14, 1946
2,455,297	Curtis et al.	Nov. 30, 1948
2,522,824	Hicks	Sept. 19, 1950
2,633,292	Voznica	Mar. 31, 1953
2,639,855	Daniels	May 26, 1953
2,641,405	Le Valley	June 9, 1953

FOREIGN PATENTS

653,295	Great Britain	May 9, 1951
---------	---------------	-------------