

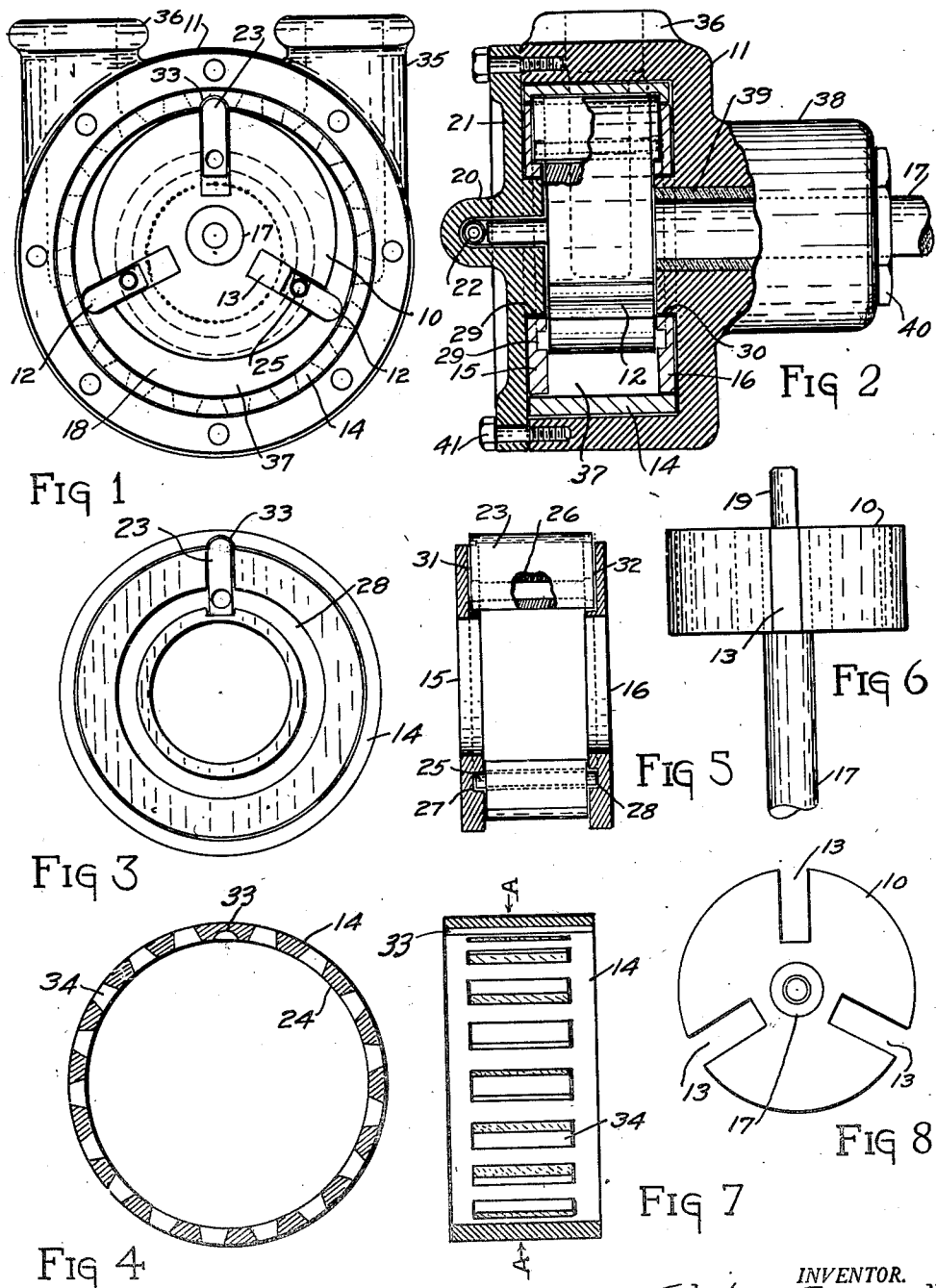
March 25, 1952

S. SCOGNAMILLO
ROTARY COMPRESSOR

2,590,729

Filed June 16, 1948

2 SHEETS—SHEET 1



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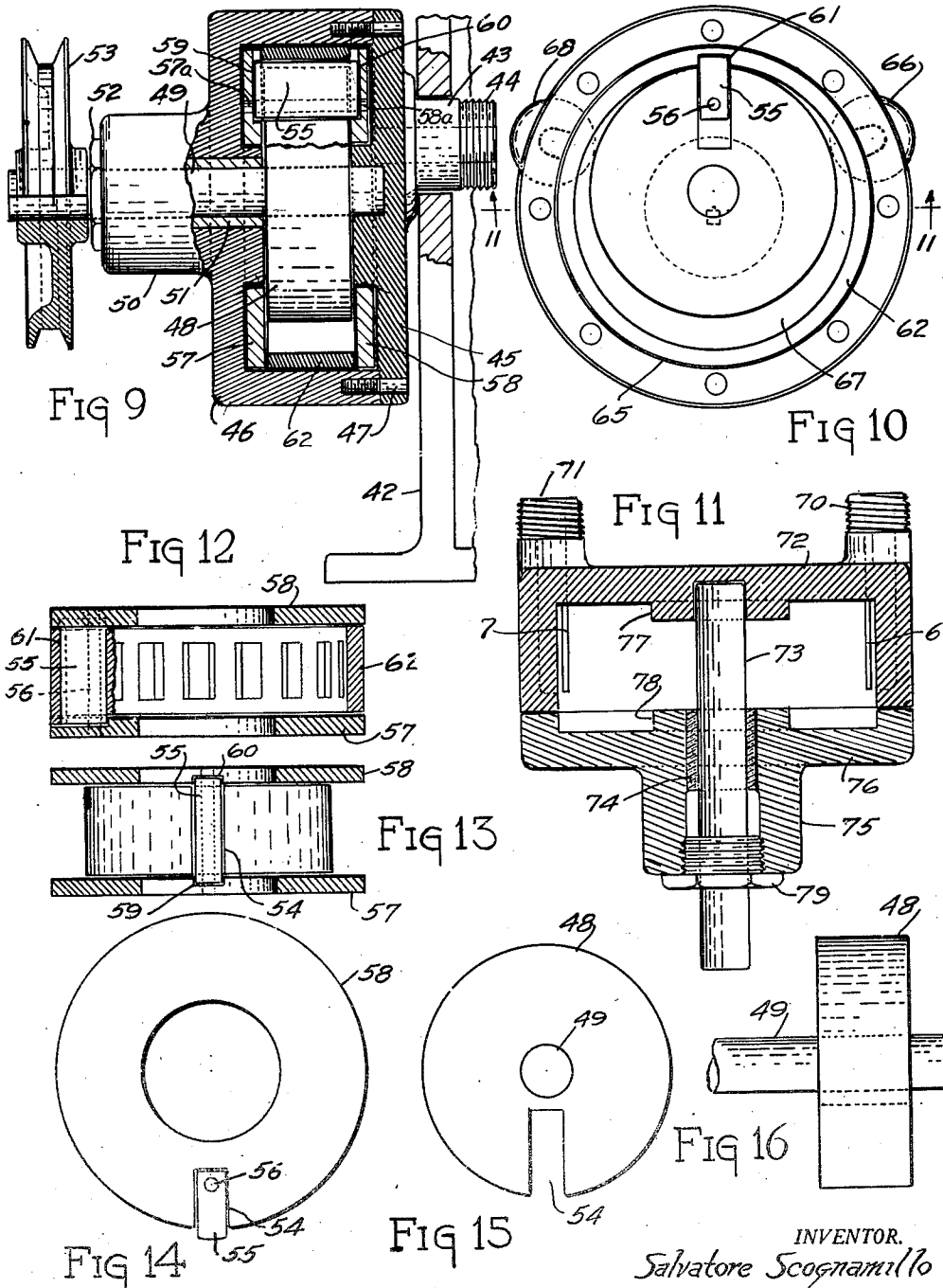
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2 SHEETS—SHEET 2



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UNITED STATES PATENT OFFICE

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ROTARY COMPRESSOR

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12 Claims. (Cl. 103—121)

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This invention relates to rotary devices such as compressors, pumps, engines, and the like, of the type wherein a rotor is eccentrically positioned in a cylindrical chamber in a housing, and in particular, the invention relates to a rotary device having an eccentrically positioned rotor with a blade or blades in radially disposed slots therein, wherein the blades are positioned within a rotating sleeve and the ends of one the blades are in engaging relation with traveling discs, so that all wiping contact between the blades and housing is eliminated.

The purpose of this invention is to improve the efficiency of rotary pumps, compressors, engines and the like, by eliminating the friction resulting from wiping contact of the ends of the blades with the inner peripheral surface of a surrounding chamber in which the rotor and blades are positioned, and also the binding between the side surfaces of blades and walls of slots in a rotor resulting from the said wiping contact between the blades and surface of the housing.

This invention is an improvement over the rotary pump of my prior Patent #2,443,994 of June 22, 1948, in which means is provided in the embodiment of a rotary sealed compartment in the crescent-shaped area, which consists of a sleeve positioned in the periphery of the pump chamber and discs positioned concentrically to the pump chamber, wherein a rotor eccentrically positioned in said chamber engages a blade the ends of which extend into slots in said discs to actuate the motion of rotation continuously in the crescent-shaped area.

In the usual rotary pump or the like, blades are radially positioned in a rotor, and as the rotor travels around the cylinder, the blades are squeezed into slots resulting in excessive wear between the edges of the blades and cylinder wall, and also between the sides of the blades and walls of the slots in which the blades are held. Furthermore, in the usual type of rotary device, the ends of the blades scrape against the end surfaces of the cylindrical chamber wherein wear develops on the ends of the blades, and grooves develop in the contacting surfaces of the housing.

With this thought in mind, this invention contemplates an improved construction for rotary devices of this type, wherein all wiping or rubbing contact between the blades and peripheral or side surfaces of the housing is eliminated.

The object of this invention is, therefore, to provide mounting and actuating means for blades in rotary devices wherein all surfaces coacting with the blades travel with the blades.

Another object of the invention is to provide continuous guide means for blades of rotary devices wherein blades are maintained in fixed relation to the inner peripheral surface of a revolving sleeve in a chamber in which the device is posi-

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tioned, and a rotor slides over the blades with a reciprocating motion in relation thereto.

Another object of the invention is to provide a rotary pump, engine, or device of the type wherein a rotor rotates concentrically about a center eccentrically positioned in a chamber wherein a continuous crescent-shaped area is provided on one side of the device, and flat blades are carried in radially disposed slots, wherein the blades travel through the crescent-shaped area causing pumping action drawing fluid in at one end of the said area and discharging the fluid from the opposite end.

Another object of this invention is to provide a rotary pump, engine, or device of the type, wherein a rotor rotates concentrically about a center eccentrically positioned in a chamber, wherein a continuous crescent-shaped area is provided in the pump chamber, the rotor engaging the blades and actuating the motion of rotation of the sleeve and discs, which are positioned concentrically to the pump chamber therein.

Another object of the invention is to provide a rotary device having a rotor rotating concentrically about a center eccentrically positioned in a cylindrical chamber wherein blades radially positioned in the rotor are held by discs traveling with the blades, and the outer ends of the blades are in continuous contact with and in fixed relation to a sleeve traveling with the discs.

Another object of the invention is to provide a rotary device having blades mounted in radially positioned slots in a rotor in which a complete self-contained unit U-shape in cross section surrounds the blades and travels therewith.

A further object of the invention is to provide a rotary device having a rotor concentrically operating about a center eccentrically positioned in a cylindrical chamber in a housing, providing a crescent-shaped area between the rotor and housing and having a sleeve with openings there-through rotatably mounted in the chamber in which an inlet connection communicates with one end of the crescent-shaped area through the openings of the sleeve, and a discharge connection communicates with the opposite end of the crescent-shaped area, also through openings in the sleeve.

A still further object of the invention is to provide a rotary device having blades radially positioned in a rotor in a cylindrical chamber in a housing, with a revolving sleeve and discs at the sides rotating with the sleeve wherein bearing shoulders are provided at the ends of the rotor on which the discs are journaled.

And a still further object of the invention is to provide an improved rotary compressor or device having a rotor with blades surrounded by a traveling unit enclosing the ends and outer edges of the blades, thereby producing sealed compart-

ments and greatly increasing the compression in the crescent space, which is of a comparatively simple and economical construction.

With these and other objects and advantages in view the invention embodies a rotary compressor or the like having a housing with inlet and discharge connections and having a cylindrical cavity or chamber therein, a rotor having radially disposed slots extending inwardly from the peripheral surface eccentrically positioned in the chamber, blades in the rotor with the ends extending beyond the ends of the rotor, pins freely mounted in the blades with the ends thereof extending beyond the ends of the blades, a perforated sleeve forming a peripheral lining in the said chamber and rotatably mounted therein, and flanges positioned at the ends of the rotor and rotatably mounted in the housing, said flanges having recesses to receive the ends of one of the blades and said sleeve having a recess to receive the edge of said blade, said rotor adapted to push the blades sliding over the same in the operation of the compressor and through the blades pushing the sleeve and flanges wherein the said sleeve and flanges rotate with the blades forming sealed compartments in a crescent-shaped area between the rotor and sleeve as the blades are pushed through the said area.

Other features and advantages of the invention will appear from the following descriptions taken from the drawings wherein:

Figure 1 is a view showing a front elevation of the compressor with the cover plate removed.

Figure 2 is a view showing a side elevation of the compressor housing with parts broken away showing the relative positions of the parts therein.

Figure 3 is an elevational view showing a sleeve forming a lining for the housing with a blade and one of the discs in combination therewith, and illustrating a modification wherein the compressor is provided with a single blade.

Figure 4 is a cross section through the sleeve taken on line A—A of Figure 7 showing the openings therein.

Figure 5 shows an assembly of the blades with traveling discs at the sides which hold the ends of one of the blades and travel therewith.

Figure 6 is a plan view of the rotor with the shaft upon which it is mounted and with the other parts omitted.

Figure 7 is a cross section through the sleeve shown in Figure 4.

Figure 8 shows an end view of the rotor.

Figure 9 is a view similar to that shown in Figure 2 illustrating a modification wherein the combination of a blade, with a rotor and an inner traveling unit is used in a compressor for refrigerants and the like.

Figure 10 is an end elevation of the compressor illustrated in Figure 9 with the cover plate removed.

Figure 11 is a modification showing a sectional plan taken on line II—II of Figure 10 showing the housing with the rotor, sleeve and discs omitted and showing the shaft bearings in the cover plate instead of in the housing as in Figure 9.

Figure 12 is a cross section through the inner self-contained unit, including the discs and sleeve and with parts broken away showing a blade positioned therein.

Figure 13 is a plan view showing a rotor with a blade mounted in a slot therein and with discs at the ends of the rotor shown in section with the section through the discs taken on the center line thereof.

Figure 14 is a view showing a side elevation of one of the discs with a blade illustrated in combination therewith.

Figure 15 is an end view of the rotor showing a blade-holding slot in one side thereof.

Figure 16 is a view showing a side elevation of the rotor with the shaft therein, and with parts of the shaft broken away.

Referring now to the drawings, wherein like reference characters denote corresponding parts, the rotary device of this invention includes a rotor 10, in a housing 11, with blades 12 and 23 freely slidable in radially disposed slots 13, and the housing is provided with a freely sliding floating and traveling perforated sleeve 14 with floating traveling discs 15 and 16 providing guide means for the blades in the ends. The rotor is mounted on a shaft 17 which is rotatably mounted in the housing and eccentrically positioned in a cylindrical chamber 18.

The rotor 10 is fixedly mounted on the shaft 17 as shown in Figure 6 and the shaft is provided with an extending end 19 that is journaled in a hub 20 of a cover plate 21 with a ball bearing 22 provided in the end of the hub to take lateral thrust. The slots 13 extend inward from the peripheral surface of the rotor, and as the rotor rotates it pushes the blades around with the center part thereof sliding away from the blades as the blades leave the center between inlet and outlet parts of the housing providing open areas at the inner ends of the slots 13, and then as rotation is continued, the rotor slides back over the blades, substantially closing the areas between the inner ends of the blades and inner ends of the slots as illustrated by the blade 23 in Figure 1.

As the rotor operates, the driving blade 23 which is positioned with the outer edge in the slot in the sleeve and the ends in slots in the discs 15 and 16 pushes the sleeve 14 and also the discs 15 and 16 which form a unit U-shape in cross section around with the rotor, providing sliding contact between the outer surfaces of the discs and sleeve with the inner surfaces of the housing and also guide means for the blade, wherein all wiping or frictional contact between the blades and housing is eliminated.

During this action, the follower blades 12 are held outward, with the outer ends in continuous engagement with the inner surface 24 of the sleeve 14 by pins 25 of the blades 12 that are freely mounted in openings 26 extending through the blades, with the ends of the pins of the blades 12 positioned in tracks 27 and 28 in the traveling discs 15 and 16 thereby providing further guide means for the blades. The discs 15 and 16 are rotatably mounted in the housing with the disc 15 freely rotatable on a shoulder 29 and the disc 16 freely rotatable on a shoulder 30, and these members are keyed through the blade 23 to the sleeve 14 as illustrated in Figures 3 and 5, wherein the ends of the blade 23 extend into slots 31 and 32 in the discs 15 and 16, respectively, and the outer edge of the blade is extended into a recess 33 in the inner surface of the sleeve 14. The sleeve 14 is provided with openings 34 that may be of any shape or size. With the parts arranged in this manner, and with the rotor rotating in a clockwise direction with the device positioned as shown in Figure 1, fluid will be drawn through an inlet connection 35 and discharged through a connection 36, with the blades entering the crescent-shaped area 37 and with the peripheral surface of the rotor traveling about the center of the shaft wherein suction is created on the inlet side

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and pressure is caused by the blades on the outlet or discharge side.

The housing illustrated in Figures 1 and 2 is formed with a hub 38 by which the pump may be mounted with a split clamp or the like, although it will be understood that the housing may be supported in any manner or by any means. The hub is provided with an inner bearing sleeve or bushing 39, and a packing gland 40 is provided at the end. The cover plate 21 is mounted on the opposite end of the housing by cap screws 41 as shown in Figure 2.

In the design shown in Figures 9 to 16, a device is illustrated that is particularly adapted for pumping or compressing a refrigerant for use in refrigerating devices and the like. For this application, the device is shown as supported in a bracket 42 through a stud 43 having a threaded end 44 on which a lock nut may be threaded. The stud 43 is provided on a cover plate 45 that is secured to a housing 46 by screws 47.

In this design, the rotor 48 is mounted on a shaft 49 that is journaled in the hub 50 of the housing 46 and the hub is provided with a bearing sleeve 51, with a packing gland 52 in the outer end. A pulley 53 may be mounted on the outer end of the shaft as shown in Figure 3. The rotor 48 is provided with a single slot 54 in which a blade 55 is positioned, and a pin 56 is freely mounted in the blade with the ends extending into openings or sockets 57a and 58a in the discs 57 and 58 respectively, and also with the ends of the blade extending into radially disposed slots 59 and 60 in the discs 57 and 58, respectively. As shown in Figures 9 and 13, the ends of the pin 56 extend into openings in the discs 57 and 58 and retain the outer wiping edge of the blade concentric with the sleeve and the inner peripheral surface of the cylindrical chamber. The outer edge of the blade extends into a longitudinally disposed recess 61 in an outer traveling sleeve 62 whereby the sleeve 62 and discs 57 and 58 are keyed by the blade to the rotor. The combination of the sleeve 62 with the discs 57 and 58 provides a self-contained unit U-shape in cross section that travels continuously with the blade so that all contact of the edge or ends of the blades with the inner surfaces of the housing is eliminated. The discs are journaled on inwardly extending hubs or bosses 63 and 64 of the cover 45 and housing 46, respectively, and this unit including the discs and sleeve is concentric with the cylindrical chamber 65 in the housing in which the rotor is eccentrically positioned. The housing is provided with an inlet connection 66 that communicates with one end of a crescent-shaped area 67 in the housing through a slot 6, and also a discharge connection 68 that communicates with the opposite end of the said crescent-shaped area through a slot 7, as shown in Figure 11.

In the design shown in Figure 11, the housing for the rotor, blade, sleeve, and discs is formed with inlet and outlet connections 70 and 71 provide in a housing 72 with a shaft 73 for the rotor rotatably mounted in a bearing 74 in a hub 75 of a cover 76. The rotor assembly including the discs, rotor, blade and pins of this design are similar to the corresponding parts of Figures 9, 10, 12 and 13. The housing is provided with a shoulder 77 on which the disc 58 is rotatably mounted, and the cover is provided with a shoulder 78 on which the disc 57 is rotatably mounted. The outer end of the hub is provided with a packing gland 79.

With the parts arranged in this manner, the

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rotor is driven through the shaft 49 by a belt or the like on a pulley 53, and as the rotor rotates, the blade 55 travels into and out of the crescent-shaped area 67 with the outer edge held in the recess in the sleeve 62, and with the ends held in slots in the discs 57 and 58. With this movement, fluid is drawn in through the connection 66 and forced out of the discharge connection 68, and the device may be used as a pump or compressor and may be used for any suitable purpose.

It will be also understood that other modifications may be made in the design and arrangement of the parts without departing from the spirit of the invention.

What is claimed is:

1. A rotary engine comprising a housing having a cylindrical chamber therein and having inlet and outlet connections communicating with said chamber, a perforated sleeve having a transverse slot in the inner surface freely mounted in the cylindrical chamber of the housing, a rotor having a radially disposed slot therein rotatably mounted in the housing and eccentrically positioned in the said cylindrical chamber, said rotor positioned to contact the sleeve at a point between the inlet and outlet connections of the housing, rotatable discs with radially disposed slots in the inner faces freely mounted in the housing and positioned at the ends of the rotor, and a blade freely slidable in the slot of the rotor and positioned with the outer edge thereof in the slot of the perforated sleeve and with the ends thereof extended beyond the ends of the rotor and positioned in the radially disposed slots of the discs.

2. A rotary engine comprising a housing having a cylindrical chamber therein and having inlet and outlet connections communicating with said chamber, said housing having cylindrical bearing shoulders extended into the ends of the said cylindrical chamber and concentric therewith, a perforated sleeve having a transverse slot in the inner surface thereof freely mounted in the cylindrical chamber of the housing, discs with aligned radially disposed slots in the inner faces thereof in the cylindrical chamber and rotatably mounted on the shoulders of the housing, a rotor having a radially disposed slot therein rotatably mounted in the housing within the sleeve and between the discs and eccentrically positioned in the sleeve and cylindrical chamber, and a blade freely slidable in the slot of the rotor and positioned with the outer edge thereof in the slot of the sleeve and with the ends extended beyond the ends of the rotor and positioned in the slots of the discs.

3. A rotary engine as described in claim 2, wherein shoulders are provided in the inner ends of the slots of the discs for continuously retaining the outer edge of the blade in the transverse slot of the perforated sleeve.

4. A rotary engine as described in claim 2, wherein additional radially disposed slots are provided in the rotor and follower blades, the ends of which are flush with the ends of the rotor, are provided in said additional slots of the rotor.

5. A rotary engine as described in claim 2, wherein additional radially disposed slots are provided in the rotor and follower blades, the ends of which are flush with the ends of the rotor are provided in said additional slots of the rotor, and wherein the said follower blades are provided with guide means coacting with the discs for retaining the outer edges of the follower blades in continuous wiping contact with the inner surface of the perforated sleeve.

6. In a rotary device, the combination which

comprises a housing having a cylindrical chamber therein with inlet and outlet connections communicating with said chamber, a perforated cylindrical sleeve positioned in the cylindrical chamber of the housing and freely rotatable therein, said sleeve having a transverse slot in the inner surface thereof, discs with radially disposed slots therein positioned in the cylindrical chamber of the housing and in the ends of the sleeve, a rotor having radially disposed blade holding slots therein positioned within the sleeve in the cylindrical chamber and journaled in the housing, a driving blade positioned in a slot of the rotor with one edge thereof extended into the transverse slot of the sleeve and the ends thereof extended into the radially disposed slots of the discs, follower blades with openings therethrough positioned in the remaining slots of the rotor, and pins extended through the openings of the follower blades and into the discs for retaining the outer edges of the follower blades in contacting relation with the inner peripheral surface of the perforated sleeve, said discs also providing guide means for the driving blade retaining the said outer edge thereof in the transverse slot of the perforated sleeve, and the peripheral surface of said rotor also contacting the inner peripheral surface of the sleeve at a point between the inlet and outlet connections of the housing.

7. A rotary device as described in claim 6, wherein the housing is provided with cylindrical shoulders extended into the said cylindrical chamber and concentric therewith, and the said discs are positioned to rotate on said shoulders.

8. A rotary device as described in claim 6, wherein the slots of the discs are provided with shoulders which provide the guide means for retaining the outer edges of the driving blade in the transverse slot of the perforated sleeve.

9. A rotary device as described in claim 6, wherein the guide means for retaining the edge of the driving blade in the transverse slot of the perforated sleeve comprises shoulders in the radially disposed slots of the discs and the inner faces of the discs are provided with annular grooves into which the ends of the pins of the follower blades extend to provide the means for retaining the follower blades in contacting relation with the perforated sleeve.

10. A rotary engine comprising a housing having a cylindrical chamber therein, said housing having inlet and outlet connections communicating with the cylindrical chamber, a perforated sleeve freely mounted in said cylindrical chamber, a rotor having a radially disposed slot therein rotatably mounted in the housing and eccentrically positioned in said cylindrical chamber, rotatable discs freely mounted in the housing and positioned at the ends of the rotor, and a blade freely slidable in the slot of the rotor and positioned with the outer edge and ends extended into the said perforated sleeve and discs, respectively, said blade having an opening therethrough, a pin freely positioned in the opening through the blade, the ends of said pin extended beyond the ends of the blade and into sockets in the said discs, the said sleeve and discs being rotated by the rotor through the blade.

11. A rotary device comprising a housing having a cylindrical chamber therein, a rotor having radially disposed slots therein eccentrically positioned in the chamber and rotatably mounted in the housing, said housing having inlet and outlet connections and said rotor positioned between the

said connections, a perforated sleeve positioned in the chamber, surrounding the rotor and journaled in the housing, said sleeve having a longitudinally disposed slot in the inner surface thereof, said housing having hubs extended into the cylindrical chamber and positioned to engage the ends of the rotor, discs having radially disposed slots in the inner faces thereof in the chamber, and positioned at the ends of the rotor and journaled on the hubs of the housing, and blades slidably mounted in the slots of the rotor with the outer edge of one of the blades extended into the slot of the sleeve and with the ends of the blade, the edge of which, extends into the slot of the sleeve extended into the radially disposed slots in the inner faces of the discs.

12. A rotary machine of the character disclosed comprising a housing having opposed end walls connected by a cylindrical wall and cooperatively forming a cylindrical chamber, said cylindrical wall having circumferentially spaced inlet and outlet ports opening to said cylindrical chamber and said end walls having inwardly projecting, stationary, opposed cylindrical hubs concentric to said cylindrical wall, a cylindrical rotor journaled eccentrically in said chamber between said opposed cylindrical hubs, said rotor having a radial slot in the periphery of the same, a blade freely slidable in said slot and projecting full width beyond opposite ends of the rotor, end discs journaled on said stationary hubs between the end walls of the housing and the opposite ends of the rotor and free for rotation independently of said rotor, said discs having radial grooves in the inner faces of the same slidably receiving the full width projecting ends of the blade and the inner ends of said radial grooves engaging the inner edges of the projecting end portions of the blade to positively hold the blade outward in the slot in the rotor and said radial grooves extending only part way through the end discs and whereby said end discs seal the projecting ends of the blade over the ends of the rotor and prevent the blade from sliding longitudinally into rubbing engagement with the end walls of the housing, and a perforated sleeve freely rotatable in said cylindrical chamber about said rotor and having a transverse slot in the inner surface of the same and receiving the outer edge of said blade.

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