May 31, 1960 C. I. WADEFELT 2,938,504

ROTARY ENGINES

Filed April 14, 1959

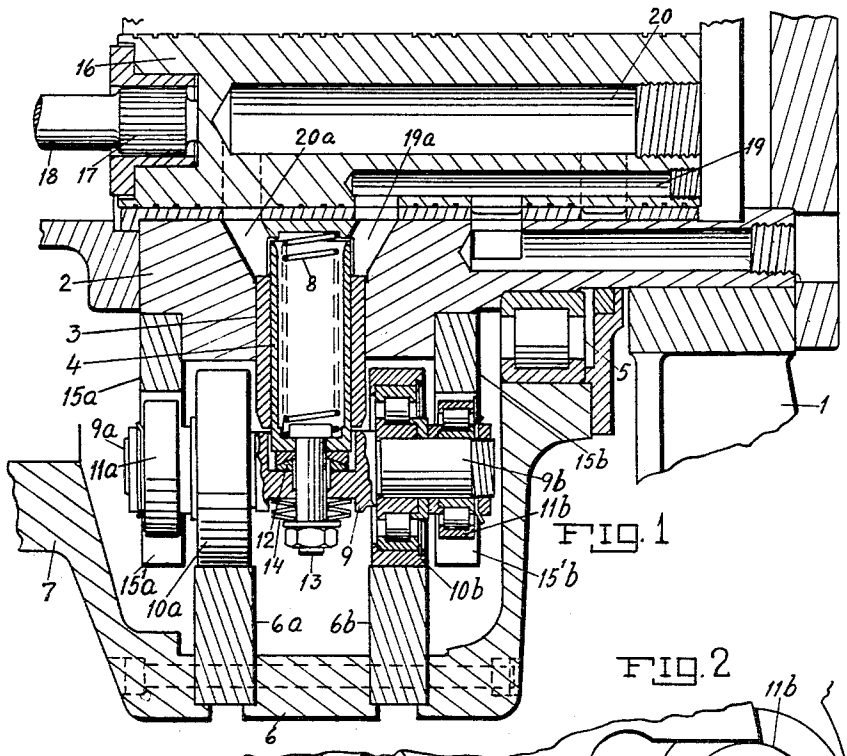



FIG. 1

FIG. 2

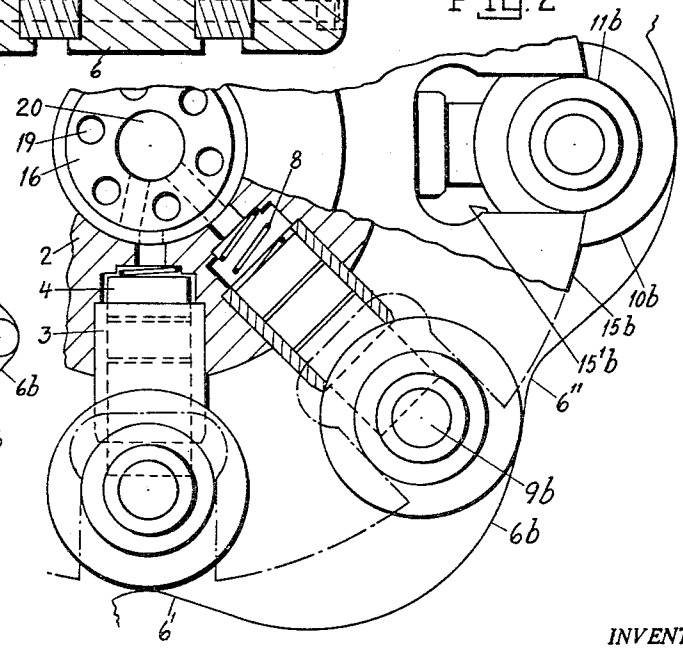
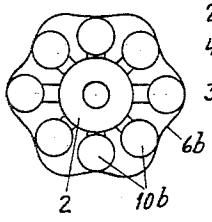



FIG. 3

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# ROTARY ENGINES

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2 Claims. (Cl. 121—61)

This invention relates to improvements in rotary engines in the shape of hydraulic motors, combustion motors or the like of the radial piston type operating without crank shafts and with top end rollers in coaction with cam rings.

Rotary engines of this kind have the advantage of being able to produce great effects in spite of small dimensions, but have at the same time the drawbacks of comparably great friction losses, low efficiency as well as mechanical difficulties, the latter on account of strong lateral reaction pressures from the cam rings and obliquely directed actions on the pistons and cylinders. Knocking sounds and vibrations will often also arise at high speeds.

One object of the invention is to obtain a rotary engine of the said kind where all laterally directed pressures created between the engine pistons and the cam rings are unburdened from the engine cylinders.

Another object of the invention is to obtain a rotary engine of the said kind where all laterally directed pressures created between the engine pistons and the cam rings are transmitted to and from the engine body with a minimum of friction losses.

A further object of the invention is to obtain a rotary engine of the said kind where knocking sounds and vibrations are totally eliminated.

Still a further object of the invention is to obtain a rotary engine of the said kind with an extremely advantageous efficiency.

With these and other objects in view the invention is essentially characterised in that guide rollers for the pistons in coaction with axial planes extending in parallelism with the piston path are positioned to take up and transmit the laterally and obliquely directed reaction and action pressures created between the engine pistons and the cam rings.

In the accompanying drawing:

Figure 1 shows a longitudinal section of a portion of the engine motor, and

Figure 2 a corresponding cross section thereof;

Figure 3 is a diagrammatical view of the motor.

The rotary engine is in the embodiment shown on the drawing exemplified as a hydraulic motor, driven, for instance, by a pressure fluid such as oil or the like. The motor consists of a stationary motor housing **2** carried by an upright standard **1** and provided with a number of radially directed cylinders **3** symmetrically placed in a circle around a centre shaft **16**. Each cylinder has a free-moving piston **4** in coaction with a rotatable cam ring body **6** surrounding the cylinders and placed on roller bearings **5**, the cam ring body being rotated by the pistons in their moving to and fro driven by the pressure oil. The cam ring body may be shaped as or combined with a belt pulley **7**, rope drum or such like, or be coupled with other machines or shafts for the transmittance of the power.

Each piston **4** consists of a sleeve with closed top end, and within the sleeve there is an additional spring **8** stretched between the top end of the sleeve and an inner



seat at the motor housing. As the pressure oil will in action move the piston outwards, the additional spring is solely intended to secure an unbroken contact for the piston with the cam ring, and this is necessary to avoid knocking sounds and vibrations at high speed where the piston has a tendency to bounce after passing the tops of the cam curves. The piston carries at its top a cross-head **9** provided with opposite directed axle pins **9***a*, **9***b* in parallelism with the motor shaft **16**, each of them carrying a pressure roller **10***a*, **10***b* in coaction with a corresponding cam ring **6***a*, **6***b* attached to the cam ring body **6**. Outermost each axle pin also carries a guide roller **11***a*, **11***b* in coaction with axial guide planes **15'***a*, **15'***b* extending in parallelism with the piston path. The cross-head rests on a curved bearing plate **12** preferably with a spherical bearing surface permitting a minor free tilting of the cross-head. The cross-head is secured by a through-going bolt **13**, and an outer spring **14** presses the cross-head against its bearing. The pressure rollers as well as the guide rollers are constructed as roller bearings.

The two cam rings **6***a*, **6***b* are similar to each other, and each cam ring has a number of cam curves **6'**, **6''** etc. constituting a row of waves. The number of waves is preferably different from the number of the motor cylinders to permit the pressure rollers to attack simultaneously different points in reference to each other on the cam ring curves as indicated in Figure 3. The closely to radial direction extending guide planes **15'***a*, **15'***b* for the guide rollers **11***a*, **11***b* constitute portions of bow-shaped recesses in circular guide plates **15***a*, **15***b* which are stationarily attached to the motor housing. Said guide planes take up the reaction pressures from the cam rings during the rotation by means of the intermediate guide rollers and transmit these pressures to the stationary motor housing. In this way all the pistons and cylinders are freed from laterally and obliquely directed pressure forces, and friction losses are reduced to a minimum.

The shaft **16** of the stationary motor constitutes a governing rotatable valve which is rotated by an acting gear in connection with the cam ring body. A shaft **18** belonging to the gear rotates the valve by means of a toothed coupling **17**. The rotatable valve is for the driving fluid provided with inlet channels **19** in alternating communication with inlets **19***a* to the cylinders, as well as with an outlet channel **20** in alternating communication with cylinder outlets **20***a*. All the inlet channels are arranged to feed the cylinders in due order with the fluid or other suitable driving media.

The rotary engine described above has the attributes of favorable balanced forces and reaction pressures with the latter taken up in such a way that the cylinders are completely unburdened of laterally directed pressures, and the friction losses are reduced to a minimum on account of the guiding rollers involving an extremely advantageous efficiency. The cross-head bearing for the rollers ensures an automatic adjustment of them, and the additional springs prevent any arising of knocking sounds. The whole arrangement results in a function totally free of vibrations.

In the drawing and specification, there has been set forth a preferred embodiment of the invention but as the execution is capable of variation and modification within the spirit of the invention I do not wish to be limited to the embodiment shown.

I claim:

1. In a rotary engine, a motor housing with a number of radial cylinders symmetrically positioned in a circle around a centre axis of the motor and provided with pistons operating without crank shafts and carrying top end press rollers on axially positioned axles in coaction with cam rings surrounding the circular row of the cyl-

inders, the motor housing and the cam rings being arranged for relative rotation in reference to each other, valve means in valving cooperation with said cylinders, guide rollers for the pistons on axial axle pins extending from the press roller axles at the piston tops in coaction with axial planes of the motor housing extending in parallelism with the piston paths, the top end axles of each piston constituting opposite directed axle pins carrying each one a press roller as well as a guide roller at each side of the piston, said axle pins extending from a cross-head on a bearing plate on the piston with a curved preferably spherical bearing surface, the cross-head being by means of a spring yieldingly pressed against the bearing plate.

2. In a rotary engine in the shape of a hydraulic motor fed by pressure fluid, a stationary motor housing with a number of radial cylinders symmetrically positioned in a circle around a centre axis of the motor and provided with pistons operating without crank shafts and carrying top end press rollers on axially positioned axles, the rollers in driving coaction with rotatable cam rings surrounding the circular row of the cylinders, the press roller axle of each piston constituting opposite directed axle pins extending from a cross-head at the top of the piston,



said cross-head resting on a bearing plate with a spherical bearing surface and being by means of a spring yieldingly pressed against the bearing plate, each axle pin carrying at the side of the piston a press roller as well as a guide roller, said guide roller in coaction with axial planes extending in parallelism with the piston path and constituting portions of bow-shaped recesses in guide plates attached to the motor housing, the piston being sleeve-shaped and provided with an inserted spring bearing against a seat in the motor housing and subjecting the piston to an out-directed pressure, a rotatable fluid-governing valve along the centre axis of the motor provided with inlets and outlets for the cylinders, the cam rings arranged and executed as driving element for other machineries.

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