June 18, 1929. J. R. REPLOGLE 1,718,196

DRIVING GEAR FOR COMPRESSORS

Filed May 28. 1927

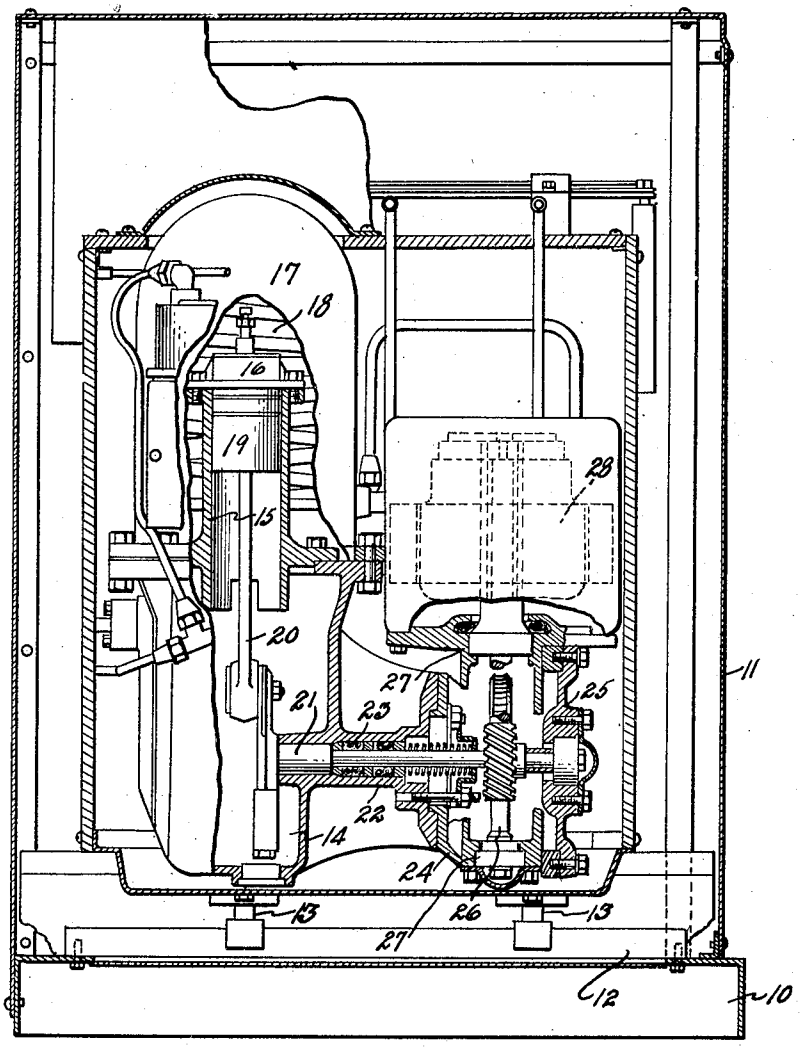


Fig. 1

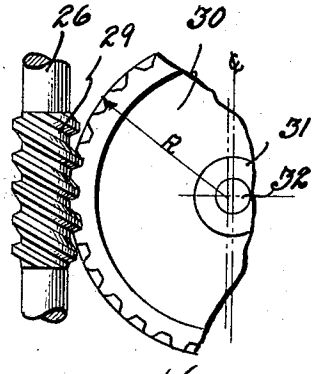


Fig. 2

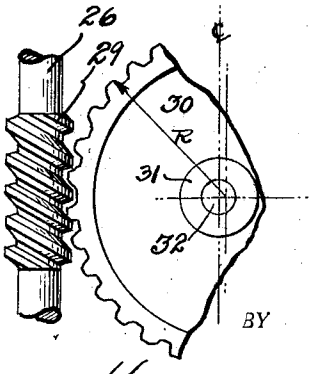


Fig. 3

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UNITED STATES PATENT OFFICE.

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DRIVING GEAR FOR COMPRESSORS.

Application filed May 28, 1927. Serial No. 195,097.

This invention relates to compressors, and more particularly to driving mechanism for compressors used with mechanical refrigerating mechanism.

When the piston of gear driven compressors used with mechanical refrigerating apparatus reaches the top center of its stroke, the expansion of the refrigerant remaining in the cylinder thereabove will tend to move the piston suddenly in a reverse direction causing objectionable noise and wear due to the back lash or clearance between the drive gearing.

An object of this invention is to overcome the above described objectionable noise in drive gearing of the character set forth, by constructing and arranging the drive gearing so that gear clearance is eliminated at the top center of the piston stroke.

Other objects that are incident or ancillary to that above mentioned will appear in the following description which sets forth a preferred embodiment of the invention.

In the accompanying drawings Fig. 1 is an elevational view, partially in section, of refrigerating apparatus having my invention associated therewith; Fig. 2 is a fragmentary elevation showing the drive gearing when the piston is at the top center of its stroke; and Fig. 3 is a fragmentary elevation showing the relation of the drive gear when the piston is at the lower center of its stroke.

Referring now to the drawings in detail, 10 represents a base upon which refrigerating mechanism of the compression-condenser-evaporator type is supported, and 11 represents a casing which surrounds the refrigerating mechanism and which is also secured to the base 10. A supporting members 12 is secured upon the base 10 and the refrigerating mechanism is mounted upon legs 13 which are secured upon the supporting member 12. The elements of the refrigerating mechanism consist generally of a compressor, a condenser, a driving motor for the compressor, and an evaporator (not shown) which are associated and operate in the manner shown and described in my co-pending application Serial No. 475,344 filed June 6, 1921.

The compressor consists of a crank case 14 upon the open upper end of which is mounted a compressor cylinder 15 having an outlet head 16 which communicates with a condenser 17 arranged to surround the exterior of the compressor cylinder, suitable water cooling coils 18 being arranged within the condenser for condensing the compressed refrigerant within the condenser. The compressor unit extends in a vertical plane and a piston 19 is arranged to reciprocate vertically within the cylinder 15, a crank arm 20 being connected to a horizontally extending crank shaft 21. The crank shaft extends through a bearing housing 22 which is formed as a part of the crank case and receives a suitable packing seal 23 which prevents compressed refrigerant escaping from the crank case.

A drive gearing housing 24 is arranged adjacent the crank shaft bearing 22 and extends in a vertical plane in parallel relation with the compressor casing. A removable end plate 25 forms one end of the drive gearing housing and is arranged to form a bearing for the outer end of the crank shaft. A drive shaft 26 extends vertically in spaced parallel relation with the crank arm 20 and is mounted in bearings 27 at the bottom and top of the drive gearing housing. A motor 28, preferably electrically driven, is mounted upon the upper end of the drive shaft 26 and is arranged to cause reciprocation of the piston through drive mechanism.

The drive mechanism consists of the drive shaft 26, the crank shaft 22, and worm gearing which is associated with such shafts to transmit rotation from the vertical drive shaft to the horizontal crank shaft. Ordinarily the worm gearing is arranged so that the pitch line of the worm and the worm gearing are spaced, and when the piston of the compressor reaches top center the expansion of the compressed refrigerant remaining in the cylinder above the piston will force the piston downwardly and cause clash of the worm gearing causing objectionable noise as well as a strain and wear upon the driving mechanism and connections. In order to prevent expansion of the refrigerant in the cylinder above the piston from causing such noise and wear due to the spaced gearing pitch line relation, I have formed and related the worm gearing so that there can be no back lash where the piston is at the top center of its stroke. A worm 29 is formed with, or rigidly secured to, the drive shaft 26 and is associated therewith to mesh with a worm gear 30 which is fixed to the crank shaft 21. The worm gear is provided with a hub portion 31 having an aperture 32 formed therein through which the crank shaft passes, and such aperture is arranged eccentrically to the

pitch line of the worm gear teeth. For the purpose of this invention it is only necessary that the eccentric relation of the shaft receiving aperture with the pitch line be slightly eccentric.

The worm gear is arranged upon the crank shaft in a relation which will cause the worm and the worm gear teeth to tightly engage when the piston is at the top center of its stroke as shown in Fig. 2, and to be spaced apart the greatest distance when the piston is at the lower center of its stroke, as shown in Fig. 3. Due to the eccentric mounting of the worm gear, the pitch line thereof and the pitch line of the worm, will gradually become closer as the piston moves upwardly during the compression stroke and will gradually become further apart as the piston moves downwardly in its return stroke.

With the worm and worm gear arranged to engage tightly when the piston is at the top center of its stroke, it will be seen that the expansion of refrigerant in the cylinder above the piston cannot cause gear clash due to back lash of the worm gearing, thus providing a quiet and longer wearing drive mechanism.

Various changes can be made in the details of the construction described and illustrated, without departing from the spirit of my invention and the scope of the appended claims.

What I claim is:

1. In refrigerant compressing mechanism, in combination with a piston having a crank arm, of rotatable driving mechanism for reciprocating said piston comprising a crank shaft connected to reciprocate said crank arm, a worm gear secured eccentrically to said crank shaft, a worm arranged to mesh with said worm gear, and a driven shaft secured to said worm, said worm gear being mounted on said crank shaft to mesh closely with said worm when said piston is at the top center of its stroke.

2. In refrigerant compressing mechanism, in combination with a piston having a crank arm, of rotatable driving mechanism for reciprocating said piston comprising a drive shaft, a driven shaft connected with the piston crank arm, and meshing gears secured to said shafts, said gears being arranged to interengage closely at the top center of the piston stroke and to interengage loosely at the lower center of the piston stroke.

3. In refrigerant compressing mechanism, in combination with a piston having an associated crank arm, of rotatable driving mechanism for reciprocating said piston comprising a drive shaft, a crank shaft connected to reciprocate said piston crank arm, and meshed gears secured to said shafts, said gears being arranged so that their pitch lines will approach during the compression stroke of said piston and recede during the return stroke of said piston.

4. In refrigerant compressing mechanism, in combination with a piston having an associated crank arm, of rotatable driving mechanism for reciprocating said piston comprising a horizontally extending crank shaft connected to said piston crank arm, a vertically extending drive shaft, a worm on said drive shaft, and a worm gear on said crank shaft meshing with said worm, said worm gear having the pitch line of its teeth arranged eccentrically relative to said worm to mesh closely therewith when said piston is at the top center of the compression stroke.

In testimony whereof I hereunto affix my signature.

JOHN R. REPLOGLE.