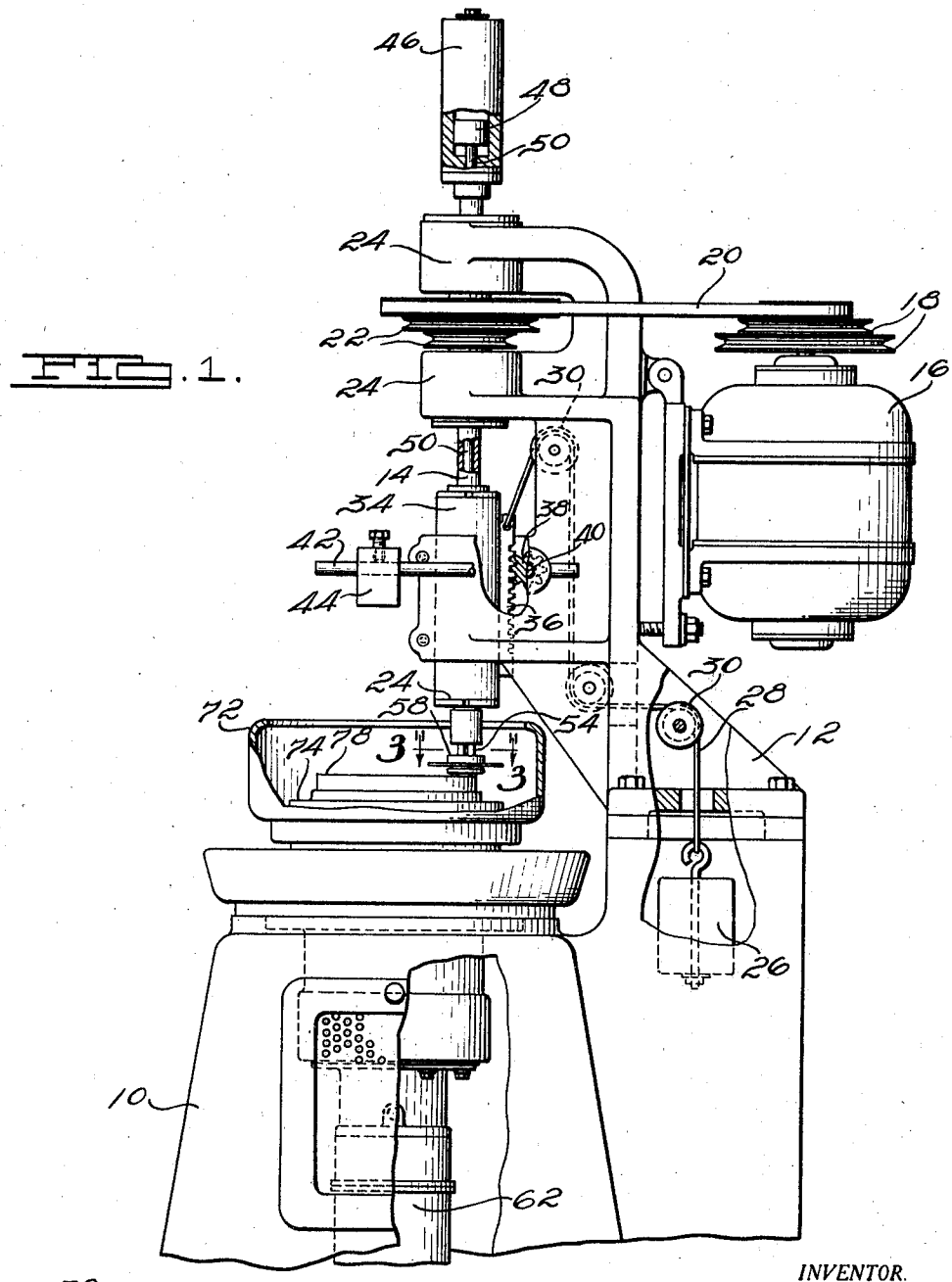
Nov. 8, 1938. H. W. AVERY 2,136,036

METHOD AND APPARATUS FOR LAPPING SEALS

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FIG. 1.



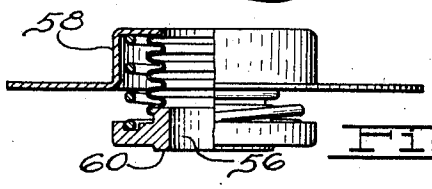


FIG. 4.

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METHOD AND APPARATUS FOR LAPPING SEALS

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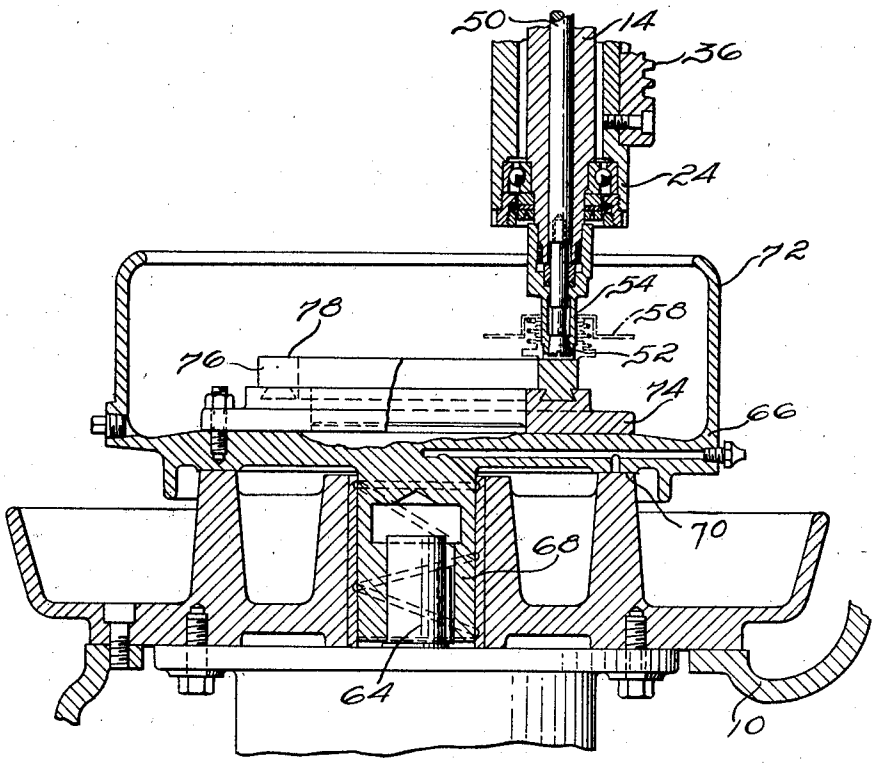
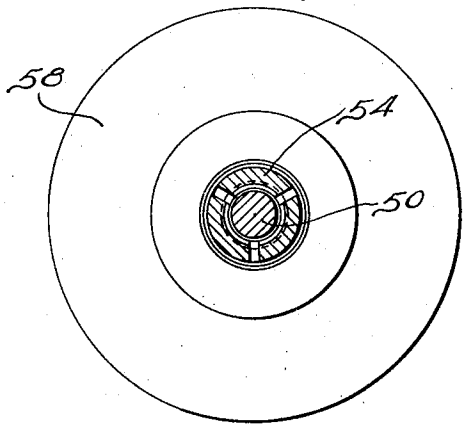


FIG. 2.

FIG. 3.



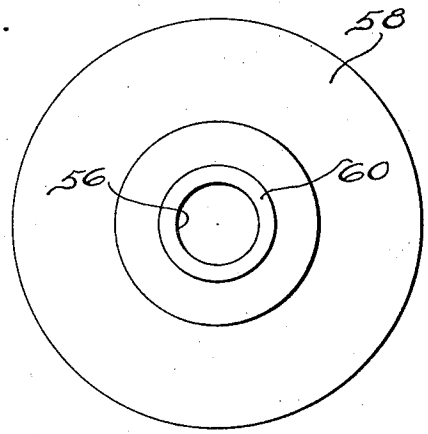


FIG. 5.

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METHOD AND APPARATUS FOR LAPPING SEALS

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Application September 12, 1934, Serial No. 743,709

5 Claims. (Cl. 51—278)

This invention relates to a method of and a machine for lapping the annular face of a seal.

In order to provide an effective seal with a running seal, it is necessary that the face thereof be lapped or polished in order to provide a plane surface and to eliminate any irregularities in the surface of the seal. Heretofore it has been the practice to lap these seals manually by rubbing the surface of the seal against a lap upon which a lapping compound has been placed. In many instances, due to the path through which the face of the seal was moved while in contact with the lap and because of some imperfections in the lapping compound, there was left in the face of the seal a scratch transversely thereof which would permit the escape of fluid from within the working chamber which the seal was intended to seal.

In refrigerating systems the shaft of a compressor therefor ordinarily is provided with a running seal to prevent the escape of lubricant and/or refrigerant from the compressor housing. The necessity of replacing seals which are defective has constituted a serious service problem which, besides impairing the efficiency of the refrigerating mechanism, necessitates the expenditure of considerable time and money in replacing such defective seals.

This invention has as a principal object the provision of means and a method of lapping seals in such a way as to insure a uniformly good sealing surface.

Another object of the invention is to provide a machine for lapping seals which will reduce the cost of this process, enabling seals to be lapped more efficiently and at a substantially less cost per seal.

Another object of this invention is to provide a method of lapping seals which eliminates the possibility of leaving transverse scratches in the face of the seal as a result of the lapping thereof.

Another object of the invention is to provide a machine for lapping seals by the method herein disclosed.

Another object of the invention is to provide a machine of the class described which is adapted for lapping seals on a production basis and which embodies means whereby seals may be affixed to the working parts of the machine to be lapped and be removed therefrom with a minimum amount of effort and time.

Other objects and advantages of the invention will be apparent from a reference to the following specification taken in conjunction with the accompanying drawings of which there are two sheets and wherein like characters are used to indicate like parts throughout the several views.

Fig. 1 is a side elevational view, partly broken away, of a machine embodying the invention and which is operable for practicing the method of lapping seals herein disclosed;

Fig. 2 is an enlarged view, partly in section, of the work table of the machine;

Fig. 3 is a sectional view taken in a plane on the line 3—3 of Fig. 1 and illustrating certain details of the machine;

Fig. 4 is an elevational view, partly in section, of a seal of the type adapted to be lapped by the machine illustrated; and

Fig. 5 is a bottom plan view of the seal illustrated in Fig. 4.

In general, the machine comprises a frame 10 adapted to house and support the operating mechanism, an arm 12 adapted to provide a support for a vertically disposed spindle 14, an electric motor 16, having a plurality of V-belt pulleys 18 connected by a V-belt 20 to a series of pulleys 22 fast on the spindle 14 and adapted for driving the same. The spindle 14 for the sake of rigidity is journaled in a plurality of bearings 24 and is mounted for vertical movement therein. A weight 26, fastened to one end of a wire rope 28 which passes over a plurality of pulleys 30 and which is connected to a collar 34 on the spindle, is provided for counterbalancing the weight of the spindle and the associated mechanism.

The collar or sleeve 34 is provided with a rack toothed portion 36 cooperable with a pinion 38 mounted upon a shaft 40 and provided with a lever 42 so that the spindle 14 may be manually vertically adjusted. A weight 44 is mounted upon the lever arm 42 and is adjustable thereon for counteracting the effect of the weight 26 so that the spindle 14 may be urged downwardly by the effect of gravity on weight 44. The motor 16, as illustrated, is suitably mounted upon the arm 12 and is adapted for driving the spindle 14 at a plurality of different speeds and is also provided with some suitable control means therefor (not illustrated).

The spindle 14 has associated therewith an air operated chuck comprising a cylinder 46, a piston 48, reciprocably mounted therein and connected to a rod 50 which extends through a central bore in the spindle 14 and at the lower end thereof is provided with a head 52 for expanding a plurality of fingers 54 provided on the lower end of spindle 14, into firm frictional engagement with the inner wall 56 of a seal. In prac-

tice, the cylinder and piston arrangements are connected to a source of air pressure and controls therefor (not illustrated) so that the head 52 may be dropped out of operative position to permit the seal 58 to be fitted externally of the fingers 54, after which the piston 48 may be controlled to cause the head 52 to expand the fingers 54 into firm frictional engagement with the wall 56 of the seal 58 for holding the same. When the seal is so held and the spindle 14 is rotated, the sealing surface 60 will rotate in a plane at right angles to the axis of rotation of the spindle 14.

The frame 10 is also provided with a second source of power 62, such as an electric motor, for driving at a relatively slow rate of speed a spindle 64 disposed along an axis parallel to that of the spindle 14. A rotary table 66 is provided with a sleeve 68 which telescopes the spindle 64 and is keyed thereto for rotation therewith. The frame 10 also is provided with suitable bearing surfaces 70 spaced from the spindle 64 for supporting the rotary table 66 adjacent the periphery thereof. The rotary table 66 is provided with a splash guard 72 and with a holder 74 for supporting a lap 76 which in the present instance is in the form of a ring.

The lap 76 rotates about its own axis at a relatively low rate of speed and so that the surface 78 of the lap passes below the spindle 14. The lap surface 78 is of substantially the same width as the diameter of the face 60 of the seal. In operation, as the lap rotates, the surface thereof moves past the spindle 14 on the lower end of which there is fixed a seal 58 to be lapped. When the spindle 14 is lowered as by movement of the lever arm 42 when the spindle is rotating at a relatively high rate of speed, the seal surface 60 is brought into contact with the surface 78 of the lap ring 76.

Preferably, a lapping compound is applied to the surface of the lap ring before the face 60 of the seal is brought into contact therewith. Since the lap 76 is rotating about its own axis, the surface thereof will be uniformly worn down by contact with the face 60 of the seal to be lapped and because the width of the surface of the lap 76 is substantially as great as the diameter of the face 60 of the seal, there will not be any tendency of the seal to groove the surface of the lap 76.

The seal 58, rotating at a relatively high rate of speed with the spindle 14 and upon its own axis when it is brought into contact with the moving lap surface, will be polished as a result of such contact. Since the seal 58 is rotating at a relatively high rate of speed about its own axis, as compared with the speed at which the surface 78 of the lap moves past the same, any scratches that appear in the face 60 of the seal as the result of being lapped will take the form of lines concentric with the axis of rotation of the seal 58 instead of lines that traverse the face of the seal in a more or less radial direction. This, of course, will prevent the movement of liquid particles across the face of the seal and along the groove formed by such a scratch. The weight 44 upon the lever arm 42 is adapted to hold the face 60 of the seal resiliently in contact with the surface 78 of the lap ring 76.

It is to be understood that the invention is not to be considered as limited to the embodiment and application thereof which has been selected here for the purpose of illustration, but is intended, rather, to embrace and include all other embodiments and applications of the new and useful principles thereof which are to be considered reasonably within the scope of the appended claims.

I claim:

1. The method of lapping a planate surface of a seal which consists in rapidly rotating said surface about its axis and against a lap surface, while slowly moving said lap surface relatively to said axis and in a plane perpendicular thereto to produce lapping marks on said planate surface concentric with respect to said axis.

2. The method of lapping seals which consists in rapidly rotating a seal about an axis perpendicular to the sealing face thereof while slowly moving a lap in contact with said face relatively to said axis thus producing lapping lines on said face concentric to said axis.

3. The method of lapping a flat annular surface of a seal to be used in high compression machinery which comprises orienting said surface by engaging a finished diameter of the seal, the axis of which coincides with the axis of said annular surface, moving said seal into contact with a flat lapping surface extending parallel to said seal face, while maintaining the orientation, and rotating said seal about said axis while maintaining the orientation and while yieldingly holding the seal surface and the lapping surface in contact with one another to produce lapping marks upon said annular surface which are concentrically arranged with respect to the same.

4. The method of lapping a flat annular surface of a seal which comprises rapidly rotating the seal about its axis which lies perpendicular to said surface, slowly moving a flat lap surface past the seal surface at such a speed that lapping occurs only along paths directed annularly about the seal surface, and holding said surfaces in contact with one another during their relative movement.

5. The method of lapping a flat surface of a seal which comprises engaging a finished inside diameter of the seal and rapidly rotating the seal about an axis centered on said internal diameter while yieldingly holding the seal against a flat slowly-moving lapping surface extending normal to said axis to effect the lapping operation along paths concentric with the finished inside diameter of the seal.

HOWARD W. AVERY.