

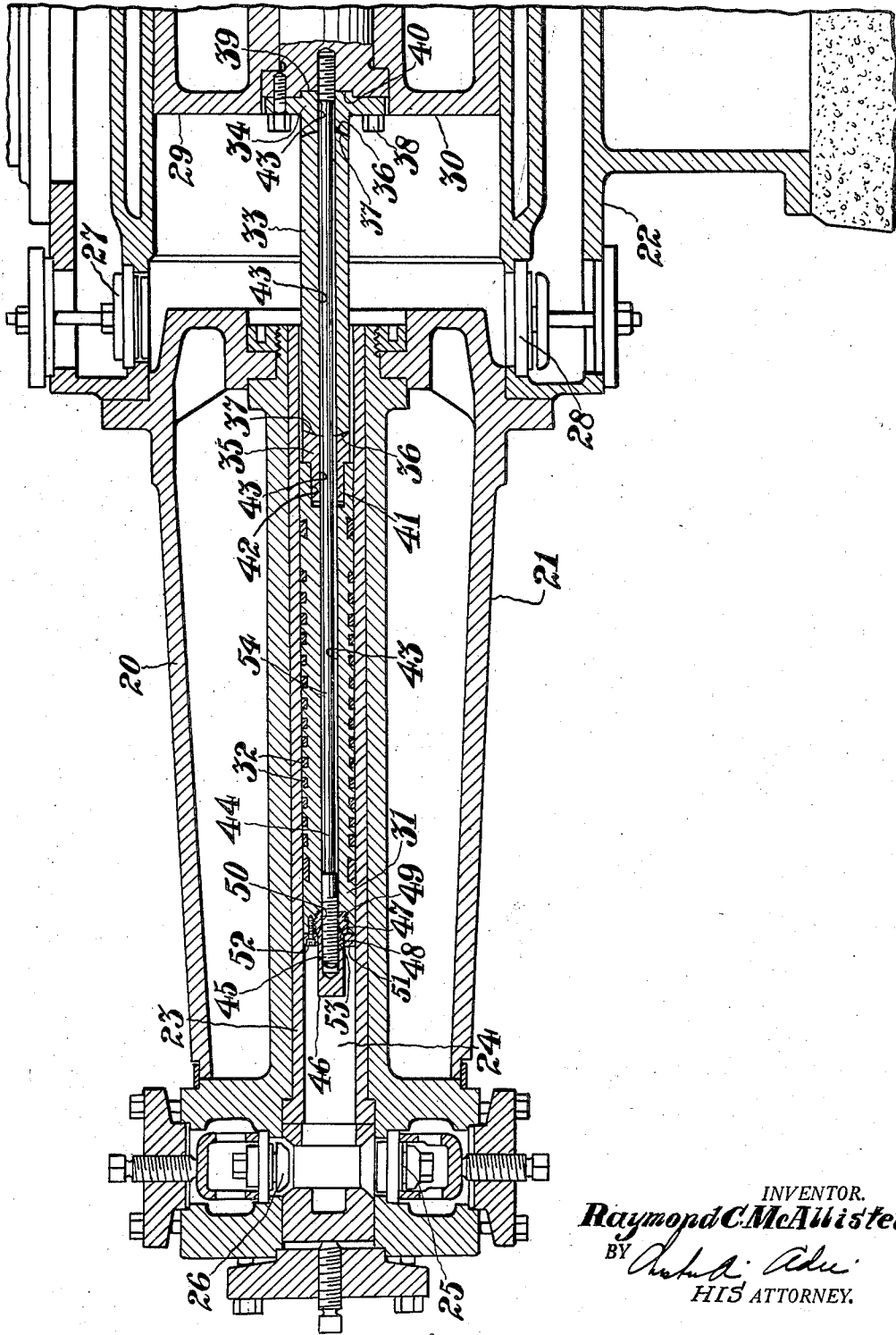
May 14, 1935.

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2,000,970

PISTON ASSEMBLY

Filed Nov. 15, 1934



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UNITED STATES PATENT OFFICE

2,000,970

PISTON ASSEMBLY

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Application November 15, 1934, Serial No. 753,129

6 Claims. (Cl. 309—4)

This invention relates to pistons, but more particularly to a differential type of piston assembly in which the pistons are formed as separate parts and held in assembled relationship with respect to each other by suitable devices.

The present invention is particularly applicable to compressors intended for high pressure duty and wherein, it is highly essential that the several portions of the piston assembly be protected against binding strains such as might be caused by slight inaccuracies in alignment of the cylinders in which the several portions of the piston assembly operate.

It is accordingly an object of the invention to enable the pistons of an assembled unit to adjust themselves laterally or angularly with respect to each other in order to prevent binding between them and the cylinders wherein they operate.

Other objects will be in part obvious and in part pointed out hereinafter.

The figure in the drawing is a longitudinal sectional elevation of a piston assembly constructed in accordance with the practice of the invention and showing it arranged within a compressor.

Referring more particularly to the drawing, 20 designates, in general, a compressor comprising final and lower stage cylinders 21 and 22, respectively. The final stage cylinder 21 may, as illustrated, be supported by the cylinder 22 and contains a liner 23 of which the interior constitutes the final stage compression chamber 24.

The admission of fluid into the chamber 24 is controlled by an inlet valve 25, and the discharge of the fluid compressed in the chamber 24 is controlled by a discharge valve 26. Likewise, the cylinder 22 is provided with inlet and discharge valves 27 and 28 to control the admission of fluid into and the discharge of the compressed fluid from the cylinder 22.

The cylinders 21 and 22 are arranged coaxially with respect to each other and contains a piston assembly, designated in its entirety, by 29. The piston assembly comprises a piston 30 in the cylinder 22 and a plunger 31 reciprocable in the compression chamber 24 and connected to the piston 30, to be actuated thereby. The plunger 31 is provided, in its periphery, with a plurality of sealing rings 32 to minimize leakage from the chamber 24. The piston 30 may be provided with similar sealing devices (not shown).

In accordance with the practice of the invention, means are provided to enable the pistons to readily adjust themselves laterally or angularly in order to compensate for such slight degrees of disalignment as may result during the

machining and assembling of the parts or as a result of fluctuations in the temperature to which the cylinders and pistons are exposed. To this end a spacer 33 is interposed between the piston 30 and the plunger 31 to seat against each or, as illustrated, against wearing members 34 and 35 carried by the piston 30 and the plunger 31, respectively.

Preferably, the spacer 33 is of slightly smaller diameter than the plunger 31, and on its ends are spherical surfaces 36 which seat against concave surfaces 37 on the wearing members 34 and 35. The wearing member 34 consists of a plate which is secured to the piston 30 by bolts 38 and has a central projection 39 extending into a recess 40 in the piston to centralize the wearing member with respect to the piston. The wearing member may conveniently consist of a cylindrical piece having a reduced stem 41 seated in a recess 42 in the end of the plunger 31.

Within the plunger 31, the spacer 33 and the wearing members 34 and 35 are registering apertures 43 to receive a tie-rod 44 whereby these members are clamped together and secured to the piston 30 to which one end of the tie-rod is threaded. The opposite end of the tie-rod is threaded, as at 45, for the accommodation of a cap-nut 46. On the inner end 47 of the nut 46 is a cone-shaped end which seats into a correspondingly shaped socket 48 of a plug 49 screwed into the adjacent end of the plunger 31 and having a cylindrical bore 50, throughout a portion of its length, to engage the contiguous portion of the tie-rod 44. The plug 49 is confined in the plunger 31 by a plate 51 secured to the end of the plunger, as by screws 52, and having an axial bore 53 through which the nut 46 extends.

Preferably the ends of the tie-rod 44 consist of up-set portions and the intermediate portion 54 of the rod 44 is thus of reduced diameter to avoid contact thereof with the walls of the apertures 43.

In assembling the device the nut 46 is manipulated in such wise as to cause the various elements constituting the plunger 31 to seat firmly against each other while at the same time permitting angular adjustment of the spacer 33 with respect to the wearing members 34 and 35. Thus, in the event that either the cylinders or the parts constituting the piston assembly become relatively disaligned the spacer 33 may readily shift itself angularly and permit each piston to assume a truly coaxial position with respect to its cylinder without binding on the walls of its cylinder.

Owing to the provision of clearance between

the intermediate portion of the tie-rod and the walls of the apertures 43 these parts may readily adjust themselves without contacting with the intermediate portion of the tie-rod. Any deflection to which the tie-rod may be subjected will, therefore, be distributed along its entire length instead of localized.

I claim:

1. A piston assembly, comprising a plurality of pistons arranged in tandem, a spacer interposed between adjacent pistons to transmit the movement of one piston to another, cooperating spherical surfaces on the spacer and adjacent pistons to permit of relative angular disalignment of the pistons, and means connected to adjacent pistons to maintain the spherical surfaces in contacting relationship with each other.

2. A piston assembly, comprising a plurality of pistons arranged in tandem, a spacer interposed between adjacent pistons to transmit the movement of one piston to another, cooperating spherical surfaces on the spacer and adjacent pistons to permit of relative angular disalignment of the pistons, and means connected to corresponding ends of adjacent pistons to maintain the spherical surfaces in contacting relationship with each other.

3. A piston assembly, comprising a plurality of pistons arranged in tandem, a spacer interposed between adjacent pistons to transmit the movement of one piston to another, cooperating spherical surfaces on the spacer and the pistons to permit of relative axial disalignment of the pistons, and means within the pistons and the spacer to maintain the spherical surfaces in contacting relationship with each other.

4. A piston assembly, comprising a pair of coaxially arranged pistons, a spacer interposed between adjacent pistons to transmit the movement of one piston to the other, cooperating spherical surfaces on the spacer and the pistons to permit of relative disalignment of the pistons, and a rod in one piston and the spacer connected to both pistons to maintain the spherical surfaces in contacting relationship with each other.

5. A piston assembly, comprising a pair of coaxially arranged pistons, a spacer interposed between adjacent pistons to transmit the movement of one piston to the other, cooperating spherical surfaces on the spacer and the pistons to permit of relative disalignment of the pistons, and a rod in the pistons and the spacer threadedly connected to the pistons to maintain the spherical surfaces in contacting relationship with each other and contacting with the encasing elements only at its extremities.

6. A piston assembly, comprising a pair of coaxially arranged pistons, a spacer interposed therebetween to transmit the movement of one piston to the other, wearing members on the confronting ends of the pistons, cooperating spherical surfaces on the wearing plates and the spacer to permit of relative disalignment of the pistons, said piston, spacer and wearing members having coaxial apertures therein, and a rod extending through the apertures and being threadedly connected to the pistons to maintain the spherical surfaces in contacting relationship, said rod having an intermediate reduced portion to avoid contact thereof with the walls of the apertures.

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