

Description

MECHANICAL FACE SEAL

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Technical Field

The present invention relates generally to a face seal, and more particularly to an oscillating and/or a rotating mechanical face seal for use in linkage pin joints found in the tracks of a track type machine.

Background Art

Mechanical face seals come in various designs and shapes, depending upon the intended applications. For example, one current production linkage pin seal for a wheel loader has a polycarbonate stiffener ring with a urethane seal ring molded onto it and simultaneously bonded to it. The urethane seal ring has an integrally formed seal lip. The seal lip is located such that compressive stress from a face load applied to the seal lip is transferred through the urethane and into the polycarbonate stiffener ring.

It has been found that in some extremely severe applications the current face seal design with the urethane seal ring and seal lip molded and bonded to a polycarbonate stiffener ring may be susceptible to leakage after extended hours of use. The leakage may be caused by the polycarbonate stiffener ring cracking during service due to the stresses imparted to it by the high face loads acting upon the seal lip. Although this leakage does not necessarily cause catastrophic failures, it can result in significant down time when the seal has to be replaced.

It is desirable to have a new mechanical face seal design that can withstand the rigors of a

severe application, such as in the pin assemblies of the track links of a track type machine and in wheel loader linkage pin joints. It has been desirable to have a face seal that includes a very strong stiffener
5 ring which is capable of withstanding high stresses for an extended period of time. It has also been desirable to optimize the location of the seal lip in relation to the stiffener ring so that a portion of the stresses caused by the high face loads are
10 absorbed by the resilient seal ring.

The present invention is directed to overcome one or more problems of heretofore utilized face seals for the wheel loader linkage pins of track-type vehicles.

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Disclosure of the Invention

In one aspect of the present invention, a mechanical face seal includes a stiffener ring having a generally "L shaped" cross section with a generally
20 radially oriented portion and a generally axially oriented portion. The generally radially oriented portion of the "L shaped" stiffener ring extends to a distance "X" measured from the generally axially oriented portion. An elastomeric covering
25 encapsulates at least a portion of the stiffener ring. The elastomeric covering is bonded to the stiffener ring. An elastomeric seal ring having a seal lip, is located adjacent an end of the generally radially oriented portion of the "L shaped" stiffener ring.
30 The seal ring and the elastomeric covering are of a unitary construction. The seal lip is located at a radial distance "Y" as measured from the generally axially oriented portion. "Y" has a value in the range of about 0.9 times "X" to about 1.1 times "X".

Brief Description of the Drawings

FIG. 1 is a sectional side view of a mechanical face seal of the present invention.

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Best Mode for Carrying Out the Invention

Referring Fig. 1 which shows a preferred embodiment of the present invention, a mechanical face seal 10 comprises a stiffener ring 20. The stiffener ring 20 has a generally "L shaped" cross section with a generally radially oriented portion 22 and a generally axially oriented portion 24. The radially oriented portion 22 of the "L shaped" stiffener ring 20 extends to a distance "X" measured from the generally axially oriented portion 24. In the preferred embodiment, the axially oriented portion 24 has a larger cross section than the radially oriented portion 22. However, various other configurations and cross sectional areas of the respective axially and radially oriented portions are encompassed within this invention. In the preferred embodiment, the stiffener ring is made from steel. Other alternative materials for making the stiffener ring can be polycarbonate or polycarbonate reinforced with reinforcing fibers such as aramid fibers, glass fibers, and the like.

The mechanical face seal 10 further comprises an elastomeric covering 30 which encapsulates at least a portion of stiffener ring 20. The elastomeric covering 30 is bonded to stiffener ring 20. Desirably, the elastomeric covering substantially encapsulates the stiffener ring and preferably, the elastomeric covering completely encapsulates the stiffener ring. In the preferred embodiment, the elastomeric covering is desirably made

from tough, resilient elastomeric materials and preferably polyurethanes. Various polyurethane materials are known to those skilled in the art such as polyether based or polyester based hydroxyl terminated polyols reacted with isocyanate which can be further strengthened by the addition of chain extenders such as 1,4 butanediol and the like. These materials are well known to those skilled in the art and need not be discussed in any further detail.

10 In the preferred embodiment, the mechanical face seal 10 further comprises an elastomeric seal ring 40. The elastomeric seal has a seal lip 42. The seal ring 40 is located adjacent an end of the radially oriented portion 22 of the "L" shaped stiffener ring 20. The seal ring 40 and the elastomeric covering 30 are preferably of a unitary construction. In the preferred embodiment, the seal ring and the elastomeric covering are made from an injection molded polyurethane and are of an integral unitary construction.

In the preferred embodiment, the seal lip 42 is desirably located at a radial distance "Y" which is in the range of about 0.9 times "X" to about 1.1 times "X" as measured from the axially oriented portion 24.

25 Preferably, seal lip 42 is located at a radial distance "Y" from the axially oriented portion 24 which is in the range of about 0.95 times "X" to about 1.05 times "X". In the best mode described in Fig. 1, the seal lip is located at a radial distance "Y" which is equal to the radial distance "X". It is desirable to maintain the location of the seal lip at a radial distance "Y" wherein "Y" has a value in the range of about 0.9 times "X" to about 1.1 times "X" because this location of the seal lip in relation to the

stiffener ring takes advantage of the toughness and resiliency of the urethane when subjected to a high face load. A portion of the face load acting upon the polyurethane seal lip is transferred through the seal
5 lip into the steel stiffener ring and a portion of the load is absorbed by the resilient polyurethane covering itself. Hence, the location of the seal lip is a critical element of this invention and is vital to producing to producing a dependable seal which can
10 endure high face loads and severe applications such as a loader linkage pin.

Industrial Applicability

The present invention is particularly useful
15 for making oscillating and/or rotating mechanical face seals for use in linkage pin joints found in the tracks of a track type machine.

Other aspects, objects and advantages of this invention can be obtained from a study of the
20 drawings, the disclosure and the appended claims.



Claims

1. A mechanical face seal, comprising:
a stiffener ring having a generally "L
5 shaped" cross section with a generally radially
oriented portion and a generally axially oriented
portion, said generally radially oriented portion of
said "L shaped" stiffener ring extending to a distance
"X" measured from said generally axially oriented
10 portion;
an elastomeric covering encapsulating at
least a portion of said stiffener ring, said
elastomeric covering being bonded to said stiffener
ring;
15 an elastomeric seal ring having a seal lip,
said seal ring being located adjacent an end of said
generally radially oriented portion of said "L shaped"
stiffener ring, said seal ring and said elastomeric
covering being of a unitary construction; and
20 said seal lip being located at a radial
distance "Y" measured from said generally axially
oriented portion, said distance "Y" having a value in
a range of about 0.9 times "X" to about 1.1 times "X".
- 25 2. The mechanical face seal, as set forth
in claim 1, wherein said elastomeric covering
substantially encapsulates said stiffener ring.
- 30 3. The mechanical face seal, as set forth
in claim 1, wherein said elastomeric covering
completely encapsulates said stiffener ring



4. The mechanical face seal, as set forth in claim 1, wherein said elastomeric covering is made from polyurethane.

5 5. The mechanical face seal, as set forth in claim 1, wherein said seal ring and said elastomeric covering are of an injection molded unitary construction, said seal ring and said elastomeric covering being formed from the same
10 material.

6. The mechanical face seal, as set forth in claim 1, wherein said distance "Y" has a value in a range of about 0.95 times "X" to about 1.05 times "X".
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7. The mechanical face seal, as set forth in claim 6, wherein said distance "Y" is equal to said distance "X".

20 8. The mechanical face seal, as set forth in claim 1, wherein said generally axially oriented portion has a larger cross-section than said generally radially oriented portion.

25 9. The mechanical face seal, as set forth in claim 1, wherein said stiffener ring is made from steel.