

European Patent 0515715 Application No. 91108772.4

The invention relates to a linear drive having a longitudinally slotted cylinder housing, in the interior of which a driving member is arranged so as to be drivable in a reciprocating manner and engages through the longitudinal slot with a lateral attachment, the longitudinal slot being sealed on its outside by an outer sealing tape which extends over the length of the housing and on its inside by an inner sealing tape which likewise extends over the length of the housing, the two sealing tapes being raised from the longitudinal slot in the region of the attachment and each passing through one tunnel-shaped channel in the driving member.

Linear drives of this type are known. In the case of one type of this linear drive, known for example from DE-A-3 520 419, the driving member in the interior of the cylinder housing is a piston which is sealed off at its front end from the interior. In addition, the longitudinal slot is sealed off on the outside and on the inside thereof by one sealing tape in each case. The piston is moved by differences in pressure on the two front ends of the piston.

A linear drive is likewise known, in which a screw spindle is arranged inside the housing, the screw spindle when rotated displacing a member provided with a thread in the longitudinal direction.

Rotation of the driving member results in a slight degree of wear. Despite the sealing tape on the outside it is possible for wear to occur in the outer space in the region in which the said sealing tape is raised off the edges of the longitudinal slot. This is not detrimental in normal cases. If the piston is driven by compressed air, the compressed air also contains small impurities which can likewise penetrate into the outer space. On the other hand, it is also possible, particularly in the region where the sealing tape is raised, for impurities to pass from the outside of the linear drive to the interior thereof. In this case what is involved

may be for example dust or impurities in particle form. If the linear drive is to be used in an environment in which solvents are used, solvents can also penetrate into the interior of the cylinder housing and there may adversely affect or destroy the lubrication used for reducing friction. The sealing action of the sealing tape can also be impaired by deposits.

The object of the invention is to provide a linear drive, the area of application of which is widened so that it can be used both in clean rooms and in rooms with a corrosive environment.

In order to attain this object, it is provided by the invention, in the case of a linear drive of the type described above, that the said linear drive comprises at least one additional air connexion leading into the space between the two sealing tapes and being connectable to a device for generating and maintaining a pressure which is different from the pressure prevailing outside the cylinder housing.

The said linear drive provided by the invention can be used both in clean rooms and in rooms with a corrosive environment. When it is used in clean rooms, the application of an underpressure which is lower than the pressure in the clean room reliably prevents dust resulting from wear or impurities in the compressed air used for driving from entering the clean room from the cylinder housing in an uncontrolled manner. These impurities are sucked away by the underpressure between the sealing tapes.

If a room with a corrosive environment is involved, on the other hand, an excess pressure of greater or lesser magnitude is produced and maintained by the air connexion between the sealing tapes, *i.e.* a pressure which is greater than the pressure in the environment of the cylinder. This prevents dust or vapours from penetrating to the interior of the cylinder housing. In rooms with corrosive environments the slight impurities arriving from the interior of the cylinder do not have a detrimental affect.

In this way, a linear drive is modified with simple means in such a way that its range of application is enlarged.

The invention proposes in particular that the additional air connexion is arranged in the region of the end of the cylinder housing, and in particular preferably in the region of the longitudinal slot. In this way, the designs of the linear drives need not be changed.

In a further development of the invention it can be provided that two additional air connexions are present, and in particular are arranged in the region of the end of the cylinder housing.

Further features, details and advantages of the invention are set out in the Claims, the wording of which is made with reference to the contents of the description, in the following description of a preferred embodiment of the invention and with reference to the drawing, in which

Fig. 1 shows a longitudinal slot through a linear drive according to the invention;

Fig. 2 is a plan view of one end of the linear drive on an enlarged scale, and

Fig. 3 is a partial section through the end of the linear drive as shown in Fig. 1 on an enlarged scale.

The linear drive illustrated in Fig. 1 comprises a cylinder housing 1 which comprises a cylindrical interior 2 offset slightly eccentrically. At the two end faces the housing 1 is closed off by one head member 3 in each case.

The cylinder housing 1 comprises a longitudinal slot 4 which extends continuously over the entire length of the cylinder housing 1.

A drive member constructed in the form of a piston is arranged in the interior 2 so as to be longitudinally displaceable. In the region of its two end faces the piston is sealed off from the interior 2 by one continuous seal 6 in each case.

A lateral attachment 7, which engages outwards through the longitudinal slot 4, is secured to the piston 5 approximately centrally with respect to its longitudinal extension. A

yoke 8, from which the movement of the piston 5 can be taken, is secured to the attachment 7 on the outside.

The longitudinal slot 4 is sealed off on its outside by an outer sealing tape 9. On its inside the longitudinal slot 4 is sealed off by an inner sealing tape 10. The two sealing tapes 9, 10 extend in the longitudinal direction of the linear drive and are naturally wider than the longitudinal slot 4. Since the sealing tapes 9, 10 are wider than the longitudinal slot 4 and the attachment 7 is narrower than the longitudinal slot 4, the two sealing tapes 9, 10 are raised from the longitudinal slot 4 in the region of the attachment 7 and pass outwards and inwards through the yoke 8 and the piston 5 respectively. This region, in which the two sealing tapes are raised from the longitudinal slot 4, moves with the movement of the piston 5. In the example illustrated, the piston 5 is moved by compressed air, which is introduced into the head members 3 through corresponding connecting members. In this respect the linear drive is known. The sealing tapes consist of steel for example and are pressed onto the edges of the longitudinal slot with the aid of magnets.

The outer sealing tape 9 is clamped in the region of the two ends thereof with the aid of a block 11 bolted thereon. The block 11 is bolted onto the housing 1 with the aid of two bolts 12 with the interposition of a seal. The block 11 contains a bore 13 which is provided with a thread and to which a nipple for a compressed air line can be connected. The bore 13 leads into the space between the two sealing tapes 9, 10, since the sealing tape 9 terminates in front of the bore 13 in the longitudinal direction.

The opposite end of the linear drive likewise contains a block 11 of this type with an air connexion.

Fig. 2 is a plan view of the end of the linear drive on an enlarged scale. The block 11 is bolted to the housing 1 with the aid of bolts 12 immediately adjacent to the head member 3. In this case it firmly clamps the end of the outer sealing tape 9.

The same arrangement is also shown in Fig. 3. In this case it may be additionally

seen that a further seal 14 is interposed between the inner sealing tape and the end of the block 11 on the side of the head member.

If the linear drive proposed according to the invention is to be used in a clean room, an underpressure is applied to the space between the outer and the inner sealing tape 10 by way of the bore 13, the underpressure being a pressure which is lower than the pressure prevailing in the clean room. The magnitude of the underpressure depends upon the conditions of the individual case in question. If the compressed air penetrating into the space between the two sealing tapes contains certain impurities during the movement of the piston, the said impurities are sucked away without being able to reach the outside. In addition, during the sliding of the lip 16 mounted on the yoke 8, any dust resulting from wear can be sucked away by the underpressure. This applies in particular when the lip 16 which is acted upon by an O-ring 15, is designed accordingly.

If, on the other hand, the linear drive proposed by the invention is to be used in a corrosive environment, a slight excess pressure is produced by the air connexion in the interspace between the two sealing tapes 9, 10, the magnitude of the excess pressure likewise being determined in accordance with the conditions of the individual case in question. This excess pressure is reduced at those points at which the ingress of dust, chips or moisture would be possible. It thus prevents the penetration thereof into the interior of the linear drive.



Claims:

1. A linear drive having a longitudinally slotted cylinder housing (1), in the interior (2) of which a driving member is arranged so as to be drivable in a reciprocating manner and engages through the longitudinal slot (4) with a lateral attachment (7), the longitudinal slot (4) being sealed on its outside by an outer sealing tape (9) which extends over the length of the housing (1) and on its inside by an inner sealing tape (10) which likewise extends over the length of the housing (1), the two sealing tapes (9, 10) being raised from the longitudinal slot (4) in the region of the attachment (7) and each passing through one tunnel-shaped channel in the driving member (8), characterized in that it comprises at least one additional air connexion (13) leading into the space between the two sealing tapes (9, 10) and being connectable to a device for generating and maintaining a pressure which is different from the pressure prevailing outside the cylinder housing (1).
2. A linear drive according to Claim 1, characterized in that the additional air connexion (13) is arranged in the region of the end of the cylinder housing (1).
3. A linear drive according to Claim 1 or 2, characterized in that two additional air connexions (13) are present.
4. A linear drive according to Claim 1, 2 or 3, characterized in that the additional air connexion (13) is arranged in the region of the longitudinal slot (4).
5. A linear drive according to one of Claims 1 to 4, characterized in that, in order to use it in a clean room, an underpressure is applied to the additional air connexion (13).
6. A linear drive according to one of Claims 1 to 4, characterized in that, in order to use it in a corrosive environment, an overpressure is applied to the additional air connexion (13).



- 7 -

7. A method of operating a linear drive according to one of Claims 1 to 6, characterized in that, in order to use the linear drive in a clean room, an underpressure is applied and maintained in the region between the two sealing tapes (9, 10).
8. A method of operating a linear drive according to one of Claims 1 to 6, characterized in that, in order to use the linear drive in a corrosive environment, an overpressure is applied and maintained in the region between the two sealing tapes.
9. A method of operating a linear drive according to Claim 7 or 8, characterized in that the pressure is constantly maintained, even when the drive member has stopped.