GEAR ASSEMBLY AND USE IN CYLINDER LOCK

FIELD OF THE INVENTION

The present invention relates to gear assemblies and locking apparatus generally, and more particularly to a compact gear assembly, which among other uses, may fit in a plug bore in a cylinder lock for electromechanical operation of the cylinder lock.

BACKGROUND OF THE INVENTION

As is well known in the art, there are many electromechanical cylinder locks operated by an electric motor that turns a locking element in a motor-driven cylinder lock.

Known prior art systems use motors that require a reduction in rotational speed to operate the motor-driven cylinder lock. The known reduction gears are large and must be located outside the cylinder lock.

SUMMARY OF THE INVENTION

Embodiments of ~~The~~ the present invention seek~~s~~ to provide a novel compact gear assembly, typically used as a reduction gear, which among other uses, may fit in a plug bore in a cylinder lock for electromechanical operation of the cylinder lock, as is described more in detail hereinbelow. Thus, in one of its uses, the gear assembly resides in the cylinder lock.

There is thus provided in accordance with an ~~embodiment~~ aspect of the present invention an assembly including a cylinder lock including a rotatable member for actuating a~~n external~~ locking element, and characterized by a reduction gear disposed inside the cylinder lock, the reduction gear mechanically linked to the rotatable member and operable to rotate the rotatable member, the reduction gear including an interface member for connection to an actuator for movement of the reduction gear, wherein the reduction gear comprises an inner gear and an outer gear, the inner gear being arranged for a translational and/or a rotational movement about a rotation axis and the outer gear being arranged for rotation about the rotation axis.

Non-limiting embodiments of the invention include one or more of the following features.

~~The reduction gear includes an inner gear and an outer gear, the outer gear arranged for rotation about a rotation axis.~~

The rotatable member and the reduction gear are both arranged for rotation about the rotation axis.

The inner gear is arranged for translational movement, wherein during translational movement of the inner gear, the inner gear meshes with the outer gear and causes the outer gear to rotate about the rotation axis. The inner gear does not rotate.

The inner gear is mounted on a shaft that includes an eccentric member which is eccentric to the rotation axis, and during rotation of the shaft about the rotation axis, the eccentric member causes the inner gear to move in the translational movement.

A limiter constrains the translational movement of the inner gear within defined limits, the limiter not extending beyond outer teeth of the inner gear. The limiter is a straight-sided member that extends axially from the inner gear, the limiter being arranged for movement in an inner periphery of a first boundary member. An outer perimeter of the first boundary member is straight-sided, and the first boundary member is arranged for movement in an inner periphery of a second boundary member, and the first and second boundary members are mounted on the shaft.

Alternatively, there may be an embodiment wherein the inner gear rotates about the rotation axis.

There is also ~~provided in accordance with an embodiment of the present invention~~disclosed a gear assembly including an inner gear and an outer gear, the outer gear arranged for rotation about a rotation axis and the inner gear arranged for translational movement, wherein during translational movement of the inner gear, the inner gear meshes with the outer gear and causes the outer gear to rotate about the rotation axis, and a limiter that constrains the translational movement of the inner gear within defined limits, the limiter not extending beyond outer teeth of the inner gear.

There is also ~~provided in accordance with an embodiment of the present invention~~disclosed a gear assembly including an inner gear and an outer gear, the inner gear arranged for rotation about a rotation axis and the outer gear arranged for translational movement, wherein during translational movement of the outer gear, the outer gear meshes with the inner gear and causes the inner gear to rotate about the rotation axis. ~~This embodiment~~The gear assembly as disclosed may be used for increasing the input rotational speed instead of reducing the input speed.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be understood and appreciated more fully from the following detailed description, taken in conjunction with the drawings in which:

Fig. 1 is a simplified pictorial illustration of a reduction gear, constructed and operative in accordance with an embodiment of the present invention;

Fig. 2 is a simplified side view of the reduction gear of Fig. 1;

Fig. 2A is a simplified sectional view of the reduction gear of Fig. 2, taken along lines A-A in Fig. 2;

Fig. 2B is a simplified sectional view of the reduction gear of Fig. 2, taken along lines B-B in Fig. 2A;

Fig. 2C is a simplified sectional view of the reduction gear of Fig. 2, taken along lines C-C in Fig. 2A;

CLAIMS

What is claimed is:

1. A lock assembly comprising:

a cylinder lock comprising a rotatable member for actuating ~~an external~~ locking element; and characterized by

a reduction gear disposed inside said cylinder lock, said reduction gear mechanically linked to said rotatable member and operable to rotate said rotatable member, said reduction gear comprising an interface member for connection to an actuator for movement of said reduction gear, wherein said reduction gear comprises an inner gear and an outer gear, said inner gear being arranged for a translational and/or a rotational movement about a rotation axis and said outer gear being arranged for rotation about said rotation axis.

~~2. The lock assembly according to claim 1, wherein said reduction gear comprises an inner gear and an outer gear, said outer gear arranged for rotation about a rotation axis.~~

~~3~~2. The lock assembly according to claim ~~2~~1, wherein said rotatable member and said reduction gear are both arranged for rotation about said rotation axis.

~~4~~3. The lock assembly according to claim ~~2~~1, wherein said inner gear is arranged for translational movement, wherein during translational movement of said inner gear, said inner gear meshes with said outer gear and causes said outer gear to rotate about said rotation axis.

~~5~~4. The lock assembly according to claim ~~2~~1, wherein said inner gear does not rotate.

~~6~~5. The lock assembly according to claim ~~2~~1, wherein said inner gear is mounted on a shaft that comprises an eccentric member which is eccentric to said rotation axis, and during rotation of said shaft about said rotation axis, said eccentric member causes said inner gear to move in said translational movement.

~~7~~6. The lock assembly according to claim ~~4~~3, further comprising a limiter that constrains said translational movement of said inner gear within defined limits, said limiter not extending beyond outer teeth of said inner gear.

~~8~~7. The lock assembly according to claim ~~7~~6, wherein said limiter is a straight-sided member that extends axially from said inner gear, said limiter being arranged for movement in an inner periphery of a first boundary member.

~~9~~8. The lock assembly according to claim ~~6~~5, further comprising a limiter that constrains said translational movement of said inner gear within defined limits, said limiter not extending beyond outer teeth of said inner gear, and wherein said limiter is a straight-sided member that extends axially from said inner gear, said limiter being arranged for movement in an inner periphery of a first boundary member, and wherein an outer perimeter of said first boundary member is straight-sided, and said first boundary

member is arranged for movement in an inner periphery of a second boundary member, and said first and second boundary members are mounted on said shaft.

~~10. The lock assembly according to claim 2, wherein said inner gear rotates about said rotation axis.~~

~~11. A gear assembly comprising:~~

~~an inner gear and an outer gear, said outer gear arranged for rotation about a rotation axis and said inner gear arranged for translational movement, wherein during translational movement of said inner gear, said inner gear meshes with said outer gear and causes said outer gear to rotate about said rotation axis; and~~

~~a limiter that constrains said translational movement of said inner gear within defined limits, said limiter not extending beyond outer teeth of said inner gear.~~

~~12. The gear assembly according to claim 11, wherein said inner gear does not rotate.~~

~~13. The gear assembly according to claim 11, wherein said inner gear is mounted on a shaft that comprises an eccentric member which is eccentric to said rotation axis, and during rotation of said shaft about said rotation axis, said eccentric member causes said inner gear to move in said translational movement.~~

~~14. The gear assembly according to claim 11, wherein said limiter is a straight-sided member that extends axially from said inner gear, said limiter being arranged for movement in an inner periphery of a first boundary member.~~

~~15. The gear assembly according to claim 14, wherein an outer perimeter of said first boundary member is straight-sided, and said first boundary member is arranged for movement in an inner periphery of a second boundary member.~~

~~16. The gear assembly according to claim 13, wherein said limiter is a straight-sided member that extends axially from said inner gear, said limiter being arranged for movement in an inner periphery of a first boundary member, and wherein an outer perimeter of said first boundary member is straight-sided, and said first boundary member is arranged for movement in an inner periphery of a second boundary member, and said first and second boundary members are mounted on said shaft.~~

~~17. The gear assembly according to claim 11, wherein said outer gear is journaled in a housing, said outer gear comprising an output shaft that extends outwards from said housing.~~

~~18. The gear assembly according to claim 11, wherein teeth of said inner and outer gears are straight-sided.~~

~~19. The gear assembly according to claim 13, further comprising a counterweight mounted on said shaft.~~

~~20. A gear assembly comprising:~~

~~an inner gear and an outer gear, said inner gear arranged for rotation about a rotation axis and said outer gear arranged for translational movement, wherein during translational movement of said outer gear, said outer gear meshes with said inner gear and causes said inner gear to rotate about said rotation axis.~~