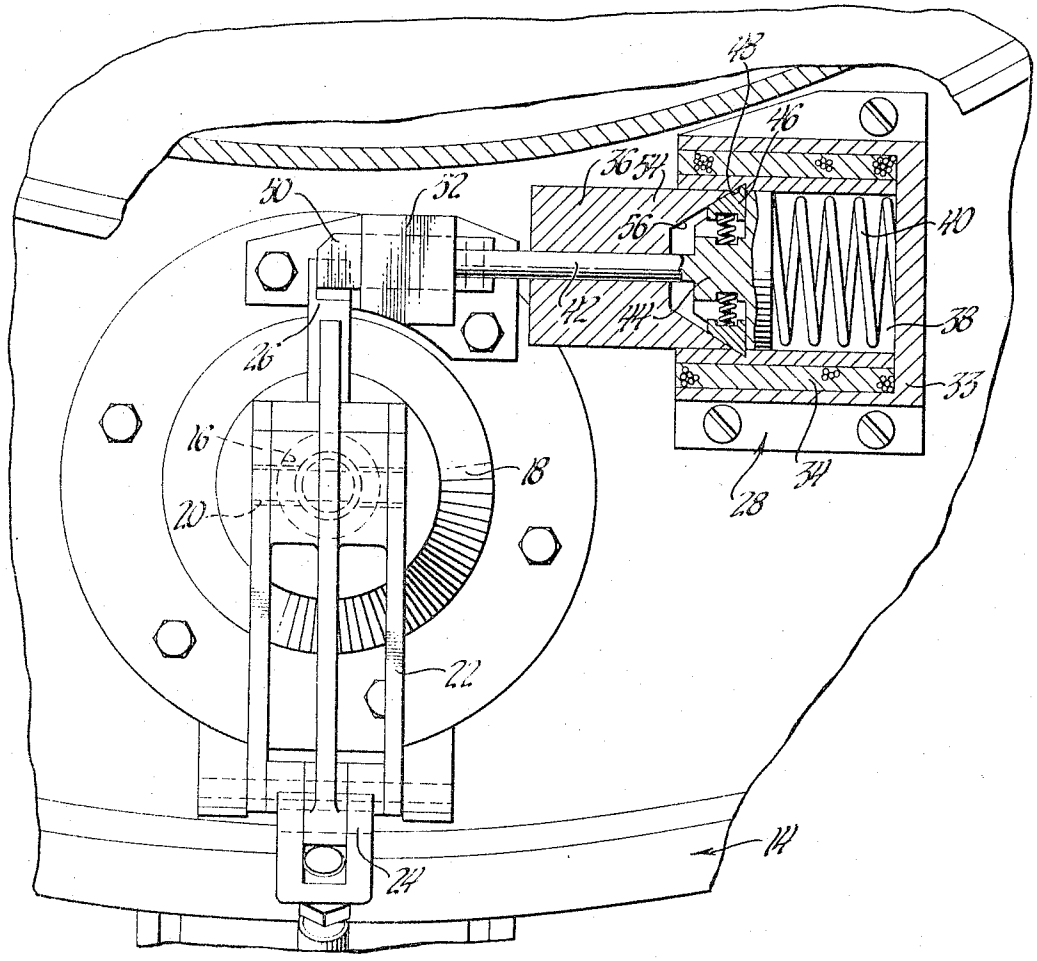
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ELECTROMAGNETIC ACTUATOR WITH DETENT MEANS

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ELECTROMAGNETIC ACTUATOR WITH DETENT MEANS

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Original application Jan. 22, 1963, Ser. No. 253,087, now Patent No. 3,245,217, dated Apr. 12, 1966. Divided and this application May 6, 1965, Ser. No. 453,708
3 Claims. (Cl. 335—253)

This application is a division of application Serial No. 253,087 filed January 22, 1963, now Patent No. 3,245,217, for a Cancellation Valve.

Our invention relates generally to an electromagnetic actuator and more specifically to an electromagnetic actuator provided with a detent to lock the actuator in one of its positions.

A general type of electromagnetic actuator uses the attraction of an armature to a magnetic field produced by a coil to translate the actuator in one direction and some non-electrical means to translate it in the opposite direction. This type of actuator has a variety of applications including uses for remotely controlling a latch, an electric switch or any remotely controllable device. In some of these applications, it is highly desirable to lock the actuator in one of its positions to prevent movement other than that intended for control purposes. Our invention is directed toward this feature of providing a detent for an electromagnetic actuator.

Accordingly, it is an object of our invention to provide an electromagnetic actuator with a detent to lock the actuator in one of its positions which is simple, uncomplicated, and comprises a minimum of parts.

Another object is to provide an electromagnetic actuator with a detent which is automatically disengaged concurrently with and by the means causing movement of the actuator away from its locked position.

Other objects, features and advantages of the invention will become apparent upon reference to the succeeding detailed description of the invention and to the annexed drawing which is an elevation view partially in cross section of a preferred embodiment thereof.

More specifically, the drawing shows an actuator in accordance with the invention used to control a latch for a port closure.

Referring to the figure, it shows a portion of a closed container indicated generally at **14** having a port **16** covered by a closure **18**. The closure **18** is coupled by a hinge pin **20** to an arm **22** pivotally mounted to the container **14** at **24**. A solenoid operated actuator indicated generally at **28** controls a latch member **50** which retains the upper end **26** of arm **22** in an upright position wherein the closure **18** carried thereon seals the port **16**.

The actuator **28** comprises an annular housing **33** having a solenoid coil **34** which retracts a solenoid plunger or armature **36** into a chamber **38** within the solenoid structure. Slidably mounted within the annular housing **33** is a rod **42** having a frusto-conical piston head **44**. The piston **44** on the rod member **42** has two spring-loaded detent members **46** which are resiliently urged outwardly into locking grooves **48** in the solenoid chamber walls **38**. The outer radial surfaces of the detents **46** is canted to match the frusto-conical piston **44** so that one contiguous surface is presented when the detents **46** are retracted into the head **44**. Attached to the other end of the rod member **42** is the closure restraining or latch member **50** which is slidable within a guide **52**. A spring **40** is disposed between the end of the solenoid chamber **38** and piston **44**. Spring **40** provides the force

which translates the rod **42** to the extreme left position where member **50** is in a latching position.

When the solenoid **34** is energized, the solenoid plunger **36** is drawn toward the right into the solenoid chamber **38**. An annular cam **54** extends from the right end of plunger **36** with an inwardly tapered inner wall **56** thereon engaging the spring-loaded detents **46** on rod **42** and camming them out of engagement with grooves **48** thereby unlocking the latch rod **42**. After this initial translation toward the right, the cam **54** mates with the frusto-conical piston **44** holding the detents **46** out of engagement and, consequently, the rod **42** is caused to become unlocked. The translation of armature **36** toward the right then continues with the armature **36**, end wall, and cam **54** abutting the face of piston **44** and drawing it, the rod **42**, and latch **50** toward the right against the action of spring **40**. As a result of this action, the upper end **26** of arm **22** is no longer retained by latch **50** and closure **18** may be pivotally removed from port **16** either manually or automatically. In order to lock the closure **18** over the port **16**, it is manually or automatically returned to a sealing position and the solenoid **34** is then deenergized. In some applications, it may be desirable to have the solenoid **34** deenergized automatically in response to the closure **18** sealingly engaging the port **16**. Upon deenergization of solenoid **34**, spring **40** will urge rod **42** and armature **36** toward the left until the detents **46** align with grooves **48**. When aligned, the detents will be spring biased outwardly locking the rod **42** and latch member **50** carried thereon into a locking position. The radial outward movement of the detents **46** also cams the armature toward the left a slight additional amount.

Thus, it can be seen that we have invented an actuator provided with detent means to lock the actuator in one of its positions wherein the detent is automatically disengaged by the means which moves the actuator away from its locked position.

It should be understood, of course, that the above description is in connection with a preferred embodiment of the invention made for the purposes of disclosure only and that various modifications and changes may be made to the example chosen for disclosure without departing from the spirit and scope of the invention as defined in the appended claims.

We claim:

1. An electromagnetic actuator comprising:
   - a fixed annular chamber open at one end, said chamber including a solenoid and a locking groove,
   - a piston reciprocably mounted in said chamber, said piston having a frusto-conical portion with a concentric rod extending axially therefrom toward said one end, said rod and piston being translatable between a first and a second position,
   - a coil spring disposed between said chamber and said piston resiliently urging said piston to said first position,
   - a plurality of circumferentially spaced detents on said piston having an outer radial surface contiguous with said frusto-conical portion, said detents being radially extendable to engage said locking groove to lock said piston in said first position,
   - an armature reciprocably mounted on said rod and engageable with said piston to translate it in an opposite direction to said second position, and
   - an annular cam extending from said armature toward said piston having an internal frusto-conical surface adapted to engage said detent and cam them out of locking engagement with said locking groove whereby said cam mates with said frusto-conical portion to unlock said piston and translate it to said second position upon energization of said solenoid.

2. An electromagnetic actuator comprising:

a fixed chamber open at one end, said chamber including a solenoid,

a piston reciprocably mounted in said chamber having a rod extending axially therefrom toward said one end, said rod and piston being translatable between a first and a second position,

spring means disposed between said chamber and said piston resiliently urging said piston to said first position,

a plurality of radially extendable detents on said piston engageable with said chamber to lock said piston in said first position,

an armature reciprocably mounted on said rod and engageable with said piston to translate it in an opposite direction to said second position, and

a cam extending from said armature toward said piston adapted to engage said detents and cam them out of locking engagement with said chamber whereby said piston and rod are unlocked and translated to said second position upon energization of said solenoid.

3. An electromagnetic actuator comprising:

a fixed chamber open at one end, said chamber including a solenoid,

actuator means reciprocably mounted in said chamber and translatable between a first and a second position,

an abutment surface on said actuator means,

spring means disposed between said chamber and said actuator means resiliently urging said actuator means to said first position,

detent means on said actuator means, said detent means being extendable out of said abutment surface and engageable with said chamber to lock said actuator means in said first position,

an armature reciprocably mounted on said actuator means and engageable with said abutment surface to translate said actuator means in an opposite direction to said second position, and

cam means on said armature extending toward said abutment surface of the actuator means adapted to engage said detent means and cam it out of locking engagement with said chamber whereby said actuator means is unlocked and translated to said second position upon energization of said solenoid.

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