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MAGNETIC SAFETY GATE LATCH

Abstract

A magnetic safety gate latch assembly and method of operation. The assembly includes: a pool latch tube, a user-actuated lid coupled to the top end of the pool latch tube; a rotatable shaft within the pool latch tube, an upper end of the shaft rigidly coupled to the lid, and a lower end of the shaft including a shaped base. The assembly further includes a magnet housing that at least partially encloses the shaped base and includes an aperture to cooperatively engage with the shaped base. The assembly further includes a bottom cover coupled to the lower end of the pool latch tube and enclosing the magnet housing, the bottom cover including an aperture facing a latch pin housing, the aperture positioned to expose a magnet. The assembly further includes a ferromagnetic latch pin and housing, and a magnetic latch pin guide slidably enclosing the latch pin.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATIONS [0001] This application is a divisional of U.S. patent application Ser. No. 18/098,839, filed on Jan. 19, 2023; now U.S. Pat. No. 12,291,904; which is a continuation of U.S. patent application Ser. No. 16/855,150, filed on Apr. 22, 2020; now U.S. Pat. No. 11,585,132; which is a continuation of U.S. patent application Ser. No. 15/715,292, filed on Sep. 26, 2017; now U.S. Pat. No. 10,662,686; which is a continuation in part of U.S. patent application Ser. No. 15/281,148, filed on Sep. 30, 2016; now U.S. Pat. No. 10,641,021. This application also claims the benefit of U.S. Provisional Patent Application Ser. No. 62/419,295, filed Nov. 8, 2016. The entire contents of each of the foregoing applications is hereby incorporated by reference in their respective entirety.

BACKGROUND

[0002] Fences and fence gates typically are installed in outdoor areas, such as lawns, yards, gardens outdoor decks, and so forth. A fence or a fence gate includes one or more posts fixed to the ground, an upright coupled to each post, and rails coupled to the upright.

[0003] Fences are often installed around swimming pools in order to control physical access to the pool. In particular, a goal of the fence is to prevent young children from entering a pool area without adult supervision, because of a risk of drowning. Similarly, the fence may be used to prevent children, who have been allowed to be in the pool area, from leaving the pool area without adult supervision. Such fences may also be mandated by local ordinances around a swimming pool. Usage of a fence in this way is not limited to swimming pools, but also may be used around substantially any attractive nuisance that could be dangerous if not properly supervised.

[0004] The fence will include a gate to allow persons to enter and to exit the pool area. A conventional latch or doorknob to keep the gate closed suffers drawbacks such as being reachable by small children or, in the case of a latch, may be prone to not being closed securely. The gate should be operable by adults but not by children. Furthermore, it is not unusual for adults using a swimming pool to leave and reenter several times, e.g., to get drinks or food, check on something within a house, and so forth. Such persons often do not carry keys.

[0005] Thus, there is a need for a gate latch and a way to operate the gate latch that is simple for adults, yet is difficult or impossible for young children to operate.

SUMMARY

[0006] Embodiments of the invention generally are directed to a latching apparatus and method for a fence gate. In particular, embodiments provide a magnetically-operated gate latch for use in a gated fence surrounding a swimming pool or other area where access needs to be controlled.

[0007] Embodiments in accordance with the present disclosure include a magnetic safety gate latch assembly including a first subassembly and a second subassembly. The first subassembly includes: a vertically-oriented pool latch tube; a lift mechanism coupled to the top end of the pool latch tube; a shaft vertically oriented within the pool latch tube, coupled to the lift mechanism, and having a lower end including a helical thread; a magnet and magnet housing, the magnet housing coupled to

the helical threading of the shaft; and a bottom cover coupled to the lower end of the pool latch tube and enclosing the magnet housing, the bottom cover including an aperture on a vertical side facing a latch pin housing, the aperture positioned to expose the magnet. The second subassembly includes the latch pin housing; a ferromagnetic latch pin; and a magnetic latch pin guide coupled to the latch pin housing and slidably enclosing at least a portion of the latch pin.

[0008] In another embodiment, a magnetic safety gate latch assembly includes a first subassembly and a second subassembly. The first subassembly includes: a pool latch tube having a vertical major axis, the pool latch tube including a top end and a lower end; a lift mechanism comprising a user-actuated lid coupled to the top end of the pool latch tube; a rotatable shaft vertically oriented within the pool latch tube, an upper end of the shaft rigidly coupled to the lift mechanism, and a lower end of the shaft comprising a shaped base; a magnet housing to house a magnet, the magnet housing at least partially enclosing the shaped base, the magnet housing comprising an upper wall having an aperture to cooperatively engage with the shaped base; and a bottom cover coupled to the lower end of the pool latch tube and enclosing the magnet housing, the bottom cover comprising an aperture on a vertical side facing a latch pin housing, the aperture positioned to expose the magnet. The second subassembly includes: the latch pin housing; a ferromagnetic latch pin; and a magnetic latch pin guide coupled to the latch pin housing and slidably enclosing at least a portion of the latch pin.

[0009] In another embodiment, a method to operate a magnetic safety gate latch assembly includes the steps of lifting a lift mechanism coupled to a shaped base, engaging the shaped base with a magnet housing, the magnet housing including an aperture to cooperate with the shaped base, rotating the lift mechanism in order to rotate the magnet housing, changing a magnetic attraction between a magnet in the magnet housing and a ferromagnetic latch pin, and retracting the ferromagnetic latch pin in order to unlock the magnetic safety latch assembly.

[0010] These and other advantages will be apparent from the present application of the embodiments described herein.

[0011] The preceding is a simplified summary to provide an understanding of some embodiments of the present invention. This summary is neither an extensive nor exhaustive overview of the present invention and its various embodiments. The summary presents selected concepts of the embodiments of the present invention in a simplified form as an introduction to the more detailed description presented below. As will be appreciated, other embodiments of the present invention are possible utilizing, alone or in combination, one or more of the features set forth above or described in detail below.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] The foregoing and other aspects of the embodiments disclosed herein are best understood from the following detailed description when read in connection with the accompanying drawings. For the purpose of illustrating the embodiments disclosed herein, there is shown in the drawings embodiments that presently are preferred, it being understood, however, the embodiments disclosed herein are not limited to the specific instrumentalities disclosed. Included in the drawings are the following figures:

[0013] FIG. 1A is an exploded oblique view of a magnetic safety gate latch system, in accordance with an embodiment of the present disclosure;

[0014] FIG. 1B is an exploded oblique view of an inner portion of the magnetic safety gate latch system of FIG. 1A, in accordance with an embodiment of the present disclosure;

[0015] FIG. 1C is a detailed exploded oblique view of a portion of FIG. 1B, in accordance with an embodiment of the present disclosure;

[0016] FIG. 2A is an exterior left plan view of a magnetic safety gate latch system in a locked position, in accordance with an embodiment of the present disclosure;

[0017] FIG. 2B is an exterior front plan view of a magnetic safety gate latch system in a locked position, in accordance with an embodiment of the present disclosure;

[0018] FIG. 2C is an exterior right plan view of a magnetic safety gate latch system in a locked position, in accordance with an embodiment of the present disclosure;

[0019] FIG. 2D is an exterior top plan view of a magnetic safety gate latch system, in accordance with an embodiment of the present disclosure;

[0020] FIG. 2E is an exterior bottom plan view of a magnetic safety gate latch system, in accordance with an embodiment of the present disclosure;

[0021] FIG. 3A is a cross-sectional rear plan view of a magnetic safety gate latch system in a locked position, in accordance with an embodiment of the present disclosure;

[0022] FIG. 3B is an interior rear plan view of a magnetic safety gate latch system in a locked position, in accordance with an embodiment of the present disclosure;

[0023] FIG. 3C is a cross-sectional left plan view of a magnetic safety gate latch system in a locked position, in accordance with an embodiment of the present disclosure;

[0024] FIG. 3D is an interior left plan view of a magnetic safety gate latch system in a locked position, in accordance with an embodiment of the present disclosure;

[0025] FIG. 3E is a cross-sectional front plan view of a magnetic safety gate latch system in a locked position, in accordance with an embodiment of the present disclosure;

[0026] FIG. 3F is an interior front plan view of a magnetic safety gate latch system in a locked position, in accordance with an embodiment of the present disclosure;

[0027] FIG. 3G is a cross-sectional right plan view of a magnetic safety gate latch system in a locked position, in accordance with an embodiment of the present disclosure;

[0028] FIG. 3H is an interior right plan view of a magnetic safety gate latch system in a locked position, in accordance with an embodiment of the present disclosure;

[0029] FIG. 4A is a cross-sectional rear plan view of a magnetic safety gate latch system in an unlocked position, in accordance with an embodiment of the present disclosure;

[0030] FIG. 4B is an interior rear plan view of a magnetic safety gate latch system in an unlocked position, in accordance with an embodiment of the present disclosure;

[0031] FIG. 4C is a cross-sectional left plan view of a magnetic safety gate latch system in an unlocked position, in accordance with an embodiment of the present disclosure;

[0032] FIG. 4D is an interior left plan view of a magnetic safety gate latch system in an unlocked position, in accordance with an embodiment of the present disclosure;

[0033] FIG. 4E is a cross-sectional front plan view of a magnetic safety gate latch system in an unlocked position, in accordance with an embodiment of the present disclosure;

[0034] FIG. 4F is an interior front plan view of a magnetic safety gate latch system in an unlocked position, in accordance with an embodiment of the present disclosure;

[0035] FIG. 4G is a cross-sectional right plan view of a magnetic safety gate latch system in an unlocked position, in accordance with an embodiment of the present disclosure;

[0036] FIG. 4H is an interior right plan view of a magnetic safety gate latch system in an unlocked position, in accordance with an embodiment of the present disclosure;

[0037] FIG. 4I is a detailed view of a portion of FIG. 4A, in accordance with an embodiment of the present disclosure;

[0038] FIG. 5A is an interior front, right and above oblique view of a magnetic safety gate latch system in a closed (i.e., locked) position, in accordance with an embodiment of the present disclosure;

[0039] FIG. 5B is a detailed interior front, right and above oblique view of a portion of a magnetic safety gate latch system in a closed position, in accordance with an embodiment of the present disclosure;

[0040] FIG. 5C is an interior front, right and above oblique view of a magnetic safety gate latch system in an open (i.e., unlocked) position, in accordance with an embodiment of the present disclosure;

[0041] FIG. 5D is a detailed interior front, right and above oblique view of a portion of a magnetic safety gate latch system in an open position, in accordance with an embodiment of the present disclosure;

[0042] FIG. 5E is a cross-sectional top plan view of a magnetic safety gate latch system in a closed position, in accordance with an embodiment of the present disclosure;

[0043] FIG. 6 is a method of operating a magnetic safety gate latch system, in accordance with an embodiment of the present disclosure;

[0044] FIG. 7A is an interior front, right and above oblique view of another embodiment of a magnetic safety gate latch system in a closed (i.e., locked) position, in accordance with an embodiment of the present disclosure;

[0045] FIG. 7B is a detailed interior front, right and above oblique view of a portion of a magnetic safety gate latch system in a closed position, in accordance with an embodiment of the present disclosure;

[0046] FIG. 8A is an interior front, right and above oblique view of a magnetic safety gate latch system in an open (i.e., unlocked) position, in accordance with an embodiment of the present disclosure;

[0047] FIG. 8B is a detailed interior front, right and above oblique view of a portion of a magnetic safety gate latch system in an open position, in accordance with an embodiment of the present disclosure;

[0048] FIG. 9 is a method of operating a magnetic safety gate latch system, in accordance with another embodiment of the present disclosure;

[0049] FIGS. 10A, 10B are front and side plan views, respectively, of a lower portion of a gate assembly in a correct alignment;

[0050] FIG. 10C, 10D are front and side plan views, respectively, of a lower portion of a gate assembly in a sagged mis-alignment;

[0051] FIG. 10E is a side cross-sectional view of a lower portion of a gate assembly in a highly sagged mis-alignment;

[0052] FIG. 11A is an exterior right plan view of a magnetic safety gate latch system in a misaligned position, in accordance with an embodiment of the present disclosure;

[0053] FIG. 11B is an exterior rear plan view of a magnetic safety gate latch system in an aligned position, in accordance with an embodiment of the present disclosure;

[0054] FIG. 11C is an exterior left plan view of a magnetic safety gate latch system in an aligned position, in accordance with an embodiment of the present disclosure;

[0055] FIG. 11D is an exterior front plan view of a magnetic safety gate latch system in a mis-aligned position, marked with cut plane C-C, in accordance with an embodiment of the present disclosure;

[0056] FIG. 11E is a cross-sectional right plan view in cut plane C-C of a magnetic safety gate latch system in a mis-aligned position, in accordance with an embodiment of the present disclosure;

[0057] FIG. 11F is a view of Detail A, which is shown in context in FIG. 11A;

[0058] FIG. 11G is a view of Detail B, which is shown in context in FIG. 11C;

[0059] FIG. 11H is a view of Detail D, which is shown in context in FIG. 11E;

[0060] FIG. 11I is an exterior front plan view of a magnetic safety gate latch system in an aligned position, marked with cut plane E-E, in accordance with an embodiment of the present disclosure;

[0061] FIG. 11J is a cross-sectional right plan view in cut plane E-E of a magnetic safety gate latch system in an aligned position, in accordance with an embodiment of the present disclosure;

[0062] FIG. 11K is an exterior right plan view of a magnetic safety gate latch system in a mis-aligned position, in accordance with an embodiment of the present disclosure;

[0063] FIG. 11L is a view of Detail F, which is shown in context in FIG. 11J;
[0064] FIG. 11M is a view of Detail G, which is shown in context in FIG. 11K;
[0065] FIG. 12 illustrates a cross-sectional view of a lid loosely coupled to a lock housing by resting on top of lock housing, in accordance with an embodiment of the present invention;
[0066] FIG. 13 is a view of a spring used to help keep a magnet housing in a preferred position, in accordance with an embodiment of the present invention;
[0067] FIG. 14 is a partially exploded view of a portion of FIG. 4A, in accordance with an embodiment of the present disclosure;
[0068] FIG. 15A is an exterior left plan view of a magnetic safety gate latch system shown in detail in FIG. 13, in accordance with an embodiment of the present invention;
[0069] FIG. 15B is a cross-sectional front plan view in cut plane N-N of the magnetic safety gate latch system of FIG. 15A, in accordance with an embodiment of the present invention;
[0070] FIG. 16A is an exterior front plan view of the magnetic safety gate latch system shown in FIG. 15A, in accordance with an embodiment of the present invention; and
[0071] FIG. 16B is a cross-sectional right plan view in cut plane O-O of the magnetic safety gate latch system shown in FIG. 16A, in accordance with an embodiment of the present invention.
[0072] While embodiments of the present invention are described herein by way of example using several illustrative drawings, embodiments of the present invention are not limited to the embodiments or drawings described. The drawings and the detailed description thereto are not intended to limit the present invention to the particular form disclosed, but also encompass all modification, equivalents and alternatives falling within the spirit and scope of embodiments of the present invention as recited by the claims.
[0073] The headings used herein are for organizational purposes only and are not meant to limit the scope of the description or the claims. As used throughout this application, the word “may” is used in a permissive sense (i.e., meaning having the potential to), rather than the mandatory sense (i.e., meaning must). Similarly, the words “include”, “including”, and “includes” mean including but not limited to. To facilitate understanding, like reference numerals have been used, where possible, to designate like elements common to the figures.

DETAILED DESCRIPTION

[0074] The phrases “at least one”, “one or more”, and “and/or” are open-ended expressions that are both conjunctive and disjunctive in operation. For example, each of the expressions “at least one of A, B and C”, “at least one of A, B, or C”, “one or more of A, B, and C”, “one or more of A, B, or C” and “A, B, and/or C” means A alone, B alone, C alone, A and B together, A and C together, B and C together, or A, B and C together.

[0075] The term “a” or “an” entity refers to one or more of that entity. As such, the terms “a” (or “an”), “one or more” and “at least one” may be used interchangeably herein. The terms “comprising”, “including”, and “having” also may be used interchangeably.

[0076] Embodiments in accordance with the present disclosure provide a latching apparatus and method for a gate, the latching apparatus incorporated with a fence post adjacent to the gate. A magnetic force from a permanent magnet may be used to keep a locking element in a locked position. The locking element may be spring-loaded such that the latching element relaxes to an unlocked state when the magnetic force from the magnet is disrupted or removed. In particular, the magnetic force may be disrupted when the magnet is rotated to break a magnetic field, or if the magnetic field is otherwise blocked.

[0077] In particular, embodiments in accordance with the present disclosure may provide a latch pin made of a magnetic material (e.g., steel), which cooperatively engages with a moveable magnet. One of the latch pin and the magnet may be coupled to a gate, and the other of the latch pin and the magnet may be coupled to a fence post. The fence post and the gate may be oriented adjacent to each other when the gate is closed.

[0078] Embodiments are usable in various gate and post configurations. For example,

embodiments are usable with either a gate for which swing hinges used to swing the gate itself are installed on the right side of the gate, or a gate for which swing hinges are installed on the left side of the gate. Embodiments are also usable with gates that swing inward toward a pool area when the gate is opened, or outward away from the pool area when the gate is opened. With respect to components described in further detail below and in FIG. 1, customization for various gate and post configurations may include whether magnetic latch pin **12**, and the assembly immediately surrounding it, is installed to the left or to the right of magnet **16**. Latch pin **12** is magnetic because it is made of a material that may be attracted to a magnet, however latch pin **12** is not necessarily itself a magnet. FIGS. 1 through 5E illustrate a configuration that may represent, e.g., a pool latch tube **2** coupled to a right-handed gate, and magnetic latch pin **12** coupled to a fence post toward the left; or, FIGS. 1 through 5E may illustrate a configuration that represents a pool latch tube **2** coupled to a fence post toward the right of a left-handed gate, and magnetic latch pin **12** coupled to the left-handed gate. Some configurations may use a mirror image of the illustration of FIG. 1, e.g., pool latch tube **2** coupled to a fence post to the left of a right-handed gate and magnetic latch pin **12** coupled to the right-handed gate, to the right of the pool latch tube **2**.

[0079] In one embodiment, when the latch is in a closed position, an end of the magnet will face the latch pin and attract the latch pin by magnetic force. The latch pin so attracted will move into a latch groove. When the latch pin is in the latch groove, the gate will be locked and cannot be opened without damaging the gate.

[0080] FIG. 1 illustrates an exploded oblique view of a magnetic safety gate latch assembly **100** in accordance with an embodiment of the present disclosure. Latch assembly **100** may be manufacturable in a variety of heights, with a specific height selected by a customer or installer according to customer need or preference. For example, latch assembly **100** may be manufactured and installed such that a top of latch assembly **100** is about 5-6 feet above the ground, and extends downward to within a few inches of the ground.

[0081] Latch assembly **100** includes an elongated pool latch tube **2**, oriented such that an axis of the elongated direction of pool latch tube **2** is vertical. Pool latch tube **2** may be attached to either a gate side or a post side of a gated opening in a fence by use of pool latch bracket **34**. Pool latch tube **2** houses a mechanism that mechanically transmits a force or action provided by a user, at or near a top end of pool latch tube **2**, to a gate locking mechanism at or near a bottom end of pool latch tube **2**. For example, a lift mechanism may be used by the user to provide the force or action to be transmitted.

[0082] Pool latch tube **2** is coupled at a top end to a pool latch tube top tube cover **19**. Top tube cover **19** may include a pool latch top insert **3**, which may be inserted into pool latch tube **2** when assembled, to help couple and stabilize top tube cover **19** to pool latch tube **2**. Insert **3** may have a smaller cross-sectional size in a horizontal plane, compared to top tube cover **19** and pool latch tube **2**, in order to facilitate insertion of insert **3** into pool latch tube **2**. Screw(s) **27** also may be used to help couple and stabilize top tube cover **19** to pool latch tube **2**. Alternatively, insert **3** may have a larger cross-sectional size in a horizontal plane, compared to pool latch tube **2**, in order to facilitate insertion of insert **3** over the outside of pool latch tube **2**.

[0083] Top tube cover **19** may be coupled to the lift mechanism. In the embodiment illustrated in FIG. 1, the lift mechanism may include pool latch lid **5** mounted to pool latch cover hinge **4**, such that pool latch lid **5** may be rotationally coupled to top tube cover **19**. The rotational coupling may be by way of pool latch cover hinge **4** and pool latch hinge pin **24**. Pool latch lid **5** is further coupled to hinge base **7** by a fastener **6** (e.g., a cap bolt) and nut **8** that threads onto fastener **6**. Hinge base **7** may be coupled further to a top end of twist drive shaft **18**, e.g., by way of clevis pin **31** configured to pass through cooperating apertures in hinge base **7** and twist drive shaft **18**, and secured in place by clip **32**.

[0084] A user operates latch assembly **100** by pulling up on pool latch lid **5**, such that pool latch lid **5** rotates around an axis of rotation formed by pool latch hinge pin **24**. As pool latch lid **5** is pulled

up, twist drive shaft **18** also is pulled up. Twist drive shaft **18** may be spring loaded such that, absent an upward force from pool latch lid **5**, twist drive shaft **18** is pushed or pulled to a lower resting position. Twist drive shaft **18** provides a mechanical linkage to transmit force from pool latch lid **5** to the gate locking mechanism at or near a bottom end of pool latch tube **2**, as described below in further detail.

[0085] In some embodiments, latch assembly **100** may include an optional pool latch lock assembly **1**, which may be a lockable assembly (e.g., key-operated or combination code operated) used by a user to enable or to prevent (depending upon the locked state of pool latch lock assembly **1**) twist drive shaft **18** from being pulled up sufficiently to actuate the gate locking mechanism at or near a bottom end of pool latch tube **2**. In some embodiments, pool latch lock assembly **1** may be partially or completely hidden behind a portion of pool latch lid **5**. The purpose of being hidden would be to provide a more aesthetically pleasing appearance. In those embodiments, pool latch lock assembly **1** may allow a relatively small amount of movement or “play” vertically of twist drive shaft **18** and/or pool latch lid **5**, such that when pool latch lock assembly **1** is in a locked state, pool latch lid **5** may be lifted up enough to expose pool latch lock assembly **1** so it can be unlocked, without causing the gate locking mechanism at or near a bottom end of pool latch tube **2** to be actuated or attempted to be actuated. In some embodiments, pool latch lock assembly **1** may be prevented from being locked when the gate locking mechanism is in an open state.

[0086] Pool latch tube **2** is coupled at a bottom end to a pool latch tube bottom cover **10**, e.g., by insertion into pool latch tube bottom cover **10** as better shown in FIG. **3A**. In turn, pool latch tube bottom cover **10** is coupled to pool latch base **33** (e.g., by sliding onto pool latch base **33** and/or use of fastener(s) **28**). Pool latch base **33** in turn is rigidly coupled to a fence element (e.g., gate, post, or upright), not illustrated in FIG. **1A**. Fastener **35** may be used to further secure pool latch base **33** to pool latch tube bottom cover **10**, as further illustrated in FIG. **2E**. Bottom cover **10** may include a pool latch bottom insert **9**, which may be inserted into pool latch tube **2** when assembled, to help couple and stabilize bottom cover **10** to pool latch tube **2**. Insert **9** may have a smaller cross-sectional size in a horizontal plane, compared to bottom cover **10** and pool latch tube **2**, in order to facilitate insertion of insert **9** into pool latch tube **2**. Screw(s) **27** also may be used to help couple and stabilize bottom cover **10** to pool latch tube **2**.

[0087] Bottom pool latch tube bottom cover **10** faces a housing formed from pool latch lock pin base cover **11** and pool latch cover **14**, illustrated in exploded form in FIG. **1**. Lock pin base cover **11** is coupled to a fence post if pool latch tube **2** is coupled to a gate. Conversely, if pool latch tube **2** is coupled to a fence post then lock pin base cover **11** will be coupled to a gate.

[0088] The housing formed by lock pin base cover **11** and pool latch cover **14** may be held together by screws **23**. The housing may enclose a spring-loaded magnetic latch pin **12**, which in turn is enclosed by magnetic latch pin guide **13**. Magnetic latch pin **12** is made from a ferromagnetic material (e.g., steel or iron). In some embodiments, magnetic latch pin **12** itself also may be a permanent magnet. Magnetic latch pin **12**, as disposed within the housing, is aligned with aperture **51** in the housing. More specifically, magnetic latch pin **12** and aperture **51** in the housing are collinear within a horizontal plane. In addition, if magnetic latch pin **12** is a magnet, then the north (N) and south (S) magnetic poles of magnetic latch pin also are within the horizontal plane, and oriented to have a predetermined magnetic pole (either N or S) oriented toward aperture **51** in the housing. A perture **51** in the housing faces bottom cover **10** and is aligned with cooperating latch groove **50** in bottom cover **10** when the gate is in a closed position. Respective latch grooves **50** may be formed in both vertical sides of bottom cover **10** in order to accommodate an installation as illustrated in FIG. **1**, or installation that is a mirror image of FIG. **1**. Threaded adjuster **25** may be used to help maintain alignment of magnetic latch pin **12** with aperture **51** in the housing.

[0089] Latch groove **50** and aperture **51** are sized to permit magnetic latch pin **12** to pass through each at least partially. Therefore, the diameters of both latch groove **50** and aperture **51** should be at least as large as the diameter of magnet latch pin **12**. The diameters of latch groove **50** and aperture

51 should be somewhat larger in order to allow for tolerance in mismatch arising from initial installation and usage or aging over time. However, the diameters of latch groove **50** and aperture **51** should not be excessively large compared to the diameter of magnet latch pin **12**, because excessive size may allow excessive relative movement between the gate and the fence post, even when the gate is locked. In some embodiments, the diameters of latch groove **50** and aperture **51** should be about 25% larger than the diameter of the magnet latch pin **12**.

[0090] Spring **30** may be used to load magnetic latch pin **12** such that in a relaxed state (i.e., not magnetically attracted), magnetic latch pin **12** is retracted within the housing formed by lock pin base cover **11** and pool latch cover **14**. Spring **30** may be located inside magnetic latch pin guide **13**, as better illustrated in FIG. **4A** and FIG. **4I**. In an attracted state (i.e., magnetically attracted to a cooperating magnetic or ferromagnetic material within bottom cover **10**), magnetic latch pin **12** may be pulled partially through latch groove **50** and aperture **51**. In the attracted state, magnetic latch pin **12** acts as a physical barrier to prevent the gate from being opened relative to the fence post, because magnetic latch pin **12** will be situated partially within latch groove **50** and partially within aperture **51**. The housing and bottom cover **10** will not be able to move significantly relative to each other because, as they move, latch groove **50** and aperture **51** no longer would be collinearly aligned with magnetic latch pin **12**. A significant movement is one that would allow the gate to open sufficiently to allow a person to pass through the gate. Within the housing formed by lock pin base cover **11** and pool latch cover **14**, pool latch lock pin base bracket **17** and adjustment screw **26** together may be used to maintain the proper placement and alignment of magnetic latch pin **12**.

[0091] Magnetic latch pin **12** may be sized in order to be sufficiently stiff in order to prevent opening of a pool gate relative to a pool fence post when a horizontal force is applied by a person, e.g., a child who is being prevented from entering or exiting a pool area, while magnetic latch pin **12** is in the attracted state. In some embodiments, the horizontal force may be at least about 20 pounds of pressure. In some embodiments, magnetic latch pin **12** may be a cylindrical rod having a length of about four inches and a diameter of about 0.5 inches.

[0092] A magnet **16** is rotatably situated within pool latch bottom insert **9**, such that the N and S poles of magnet **16** are in the same plane as magnetic latch pin **12**, latch groove **50** and aperture **51**. Magnet **16** is oriented such that in an attracted state (i.e., pool latch lid **5** not being actuated and the gate is locked), magnet **16** and magnetic latch pin **12** face each other and are magnetically attracted to each other, such that latch assembly **100** is in a locked position.

[0093] If magnetic latch pin **12** is a magnet, then magnet **16** and magnetic latch pin **12** ordinarily may face each other with opposite poles so that they magnetically attract each other. For example, if a N pole of magnetic latch pin **12** faces magnet **16**, then a S pole of magnet **16** faces magnetic latch pin **12** in order to cause the two magnets to attract each other, such that latch assembly **100** is in a locked position.

[0094] Spring **30** should be stiff enough to force ferromagnetic magnetic latch pin **12** to retract in the absence of a magnetic attraction between magnet **16** and ferromagnetic magnetic latch pin **12**, but not so strong as to prevent motion of magnet **16** and ferromagnetic magnetic latch pin **12** toward each other in the presence of a magnetic attraction between magnet **16** and ferromagnetic magnetic latch pin **12**. Thus, the desired stiffness of spring **30** is an engineering balance with the magnetic attraction between magnet **16** and ferromagnetic magnetic latch pin **12**. Spring **30** may be made of a dielectric or non-ferromagnetic material, such as a stiff but resilient plastic.

[0095] A magnet housing **22** houses and supports magnet **16**, holding magnet **16** in a known orientation that changes as magnetic safety gate latch assembly **100** is operated. Magnet housing **22** is moveably coupled to a twist drive **21**. Twist drive **21** in turn is rigidly coupled to twist drive shaft **18**. Twist drive **21** may have a helical thread (or thread of similar shape) where twist drive **21** is coupled to magnet housing **22**.

[0096] Twist drive pin **20** may be inserted through twist drive **21** to engage with twist drive shaft

18, in order to keep twist drive **21** coupled to twist drive shaft **18** and to maintain their relative orientation.

[0097] Twist drive **21** may have a larger cross-sectional area in a horizontal plane than twist drive shaft **18**, thus providing a surface upon which one end of a compression spring **15** ordinarily rests. Compression spring **15** encircles and is substantially coaxial with twist drive shaft **18**. A flange washer **29** is located upon a top end of compression spring **15**. As better illustrated in the assembled views of FIG. 3A and FIG. 4A described below, flange washer **29** is pressed against a top inner surface of pool latch bottom insert **9** by compression spring **15**. Flange washer **29** provides an unmoveable surface for compression spring **15**, whereas an opposite end of compression spring **15** is moveable as magnetic safety gate latch assembly **100** is operated.

[0098] As described above, twist drive shaft **18** is coupled to pool latch lid **5**, and twist drive shaft **18** moves up and down as pool latch lid **5** is fully moved up and down. When twist drive shaft **18** is moved up by a user, twist drive **21** also moves up, and the helically-threaded portion of twist drive **21** engages with magnet housing **22** to cause magnet housing **22** to rotate. In some embodiments (not illustrated), magnet housing **22** may include a helical thread either instead of or in addition to a helical thread on twist drive **21**. If a 1.0 inch movement of twist drive shaft **18** produces a 90 degree rotation of magnet housing **22**, then the pitch of the helical thread is 0.25 threads per inch (TPI), or conversely 4 inches per thread. When the user releases pool latch lid **5**, compression spring **15** pushes down upon twist drive **21**, causing magnet housing **22** to rotate back into a locked position.

[0099] As magnet housing **22** begins to rotate away from a locked state, the magnetic attraction of magnet **16** and magnetic latch pin **12** weakens and finally breaks as the degree of rotation increases. In some embodiments, a combination of pitch of the helically-threaded twist drive **21** and distance of travel of twist drive shaft **18** caused by operation of pool latch lid **5** will cause magnet housing **22** to rotate about 90 degrees, effectively extinguishing the magnetic coupling between magnet **16** and magnetic latch pin **12**. Once the magnetic coupling is extinguished, spring **30** will tend to force magnetic latch pin **12** into a fully retracted position, such that magnetic latch pin **12** no longer acts as a physical barrier to prevent opening of a gate relative to an adjacent post.

[0100] In other embodiments, if magnetic latch pin **12** itself is a permanent magnet, the same distance of travel of twist drive shaft **18** may cause about a 180 degree rotation of magnet housing **22**, thus causing magnet **16** and magnetic latch pin **12** to tend to repel each other.

[0101] In other embodiments, when magnetic latch pin **12** itself is a permanent magnet, spring **30** is optional and may be configured to tend to push magnetic latch pin **12** toward magnet **16** in the absence of magnetic coupling between magnet **16** and magnetic latch pin **12**, causing the gate to be locked. The gate would be unlocked by rotating magnet housing **22** such that magnet **16** and magnetic latch pin **12** repel each other. In other embodiments, when magnetic latch pin **12** is a permanent magnet and spring **30** is not used, motion of magnetic latch pin **12** may be caused by only by the force of magnetic attraction or repulsion with magnet **16**.

[0102] FIG. 1B is an exploded oblique view of an inner portion of magnetic safety gate latch assembly **100** of FIG. 1A, in accordance with an embodiment of the present disclosure. A portion of FIG. 1B is marked as Detail B.

[0103] FIG. 1C is a detailed exploded oblique view of a portion of FIG. 1B, in accordance with an embodiment of the present disclosure. FIG. 1C adds a view of tab **52**, which may be used as a hard stop to prevent magnet housing **22** from over-rotating more than a preset amount of rotation, e.g., 90 degrees or 180 degrees.

[0104] FIG. 2A illustrates a left side plan view of the exterior of magnetic safety gate latch assembly **100**, in accordance with an embodiment of the present disclosure. Features illustrated and described with respect to FIG. 1 are assigned like reference numbers. FIG. 2B illustrates a front plan view of magnetic safety gate latch assembly **100**, with front defined as the direction facing a user who will be actuating pool latch lid **5** and/or unlocking pool latch lock assembly **1**. FIG. 2C

illustrates a right plan view of magnetic safety gate latch assembly **100**.

[0105] FIG. **3A** illustrates a rear cross-sectional plan view of magnetic safety gate latch assembly **100** in a locked position, in accordance with an embodiment of the present disclosure. FIG. **3B** illustrates a rear view of the magnetic safety gate latch assembly **100** of FIG. **3A**, but without certain exterior elements such as pool latch tube **2**, lock pin base cover **11**, pool latch cover **14**, bottom cover **10** and pool latch bottom insert **9**, in order to better illustrate the interrelationship of the remaining elements.

[0106] FIG. **3C** illustrates a left side cross-sectional plan view of magnetic safety gate latch assembly **100** in a locked position, in accordance with an embodiment of the present disclosure. FIG. **3D** illustrates the magnetic safety gate latch assembly **100** of FIG. **3C**, but with certain exterior elements omitted for clarity.

[0107] FIG. **3E** illustrates a front cross-sectional plan view of magnetic safety gate latch assembly **100** in a locked position, in accordance with an embodiment of the present disclosure. FIG. **3F** illustrates the magnetic safety gate latch assembly **100** of FIG. **3E**, but with certain exterior elements omitted for clarity.

[0108] FIG. **3G** illustrates a right side cross-sectional plan view of magnetic safety gate latch assembly **100** in a locked position, in accordance with an embodiment of the present disclosure. FIG. **3H** illustrates the magnetic safety gate latch assembly **100** of FIG. **3G**, but with certain exterior elements omitted for clarity.

[0109] FIG. **4A** illustrates a rear cross-sectional plan view of magnetic safety gate latch assembly **100** in an unlocked position, in accordance with an embodiment of the present disclosure. FIG. **4B** illustrates the magnetic safety gate latch assembly **100** of FIG. **4A**, but without certain elements such as pool latch tube **2** such as lock pin base cover **11**, pool latch cover **14**, bottom cover **10** and pool latch bottom insert **9**, in order to better illustrate the interrelationship of the remaining elements.

[0110] FIG. **4C** illustrates a left side cross-sectional plan view of magnetic safety gate latch assembly **100** in an unlocked position, in accordance with an embodiment of the present disclosure. Coupling **401** is a point at which pool latch lid **5** is coupled to twist drive shaft **18**. As illustrated in FIG. **4C**, coupling **401** is not coaxial with pool latch hinge pin **24**, such that as pool latch lid **5** is rotated up and down around pool latch hinge pin **24**, twist drive shaft **18** will correspondingly be moved up and down.

[0111] FIG. **4D** illustrates the magnetic safety gate latch assembly **100** of FIG. **4C**, but without certain exterior elements.

[0112] Comparing FIGS. **4A-4C** in an unlocked position to FIGS. **3A-3C** in a locked position, it can be seen in the former that pool latch lid **5** has been lifted up, and pool latch lock assembly **1** is accessible. Twist drive shaft **18** has been pulled up by the user action of lifting pool latch lid **5**, as best seen in FIG. **4C**. Twist drive shaft **18** in turn pulls up twist drive **21**. As twist drive **21** pulls up, magnet housing **22** rotates around a vertical axis. At full travel of pool latch lid **5**, magnet housing **22** has been rotated by **90** degrees compared to the configuration of FIGS. **3A-3C**, thus breaking the magnetic attraction between magnet **16** and magnetic latch pin **12**. Spring **30** will tend to push magnetic latch pin **12** back within magnet housing **22** once the magnetic attraction is broken.

[0113] FIG. **4E** illustrates a front cross-sectional plan view of magnetic safety gate latch assembly **100** in an unlocked position, in accordance with an embodiment of the present disclosure. FIG. **4F** illustrates the magnetic safety gate latch assembly **100** of FIG. **4E**, but without certain elements.

[0114] FIG. **4G** illustrates a right side cross-sectional plan view of magnetic safety gate latch assembly **100** in a locked position, in accordance with an embodiment of the present disclosure. FIG. **4H** illustrates the magnetic safety gate latch assembly **100** of FIG. **4G**, but without certain elements.

[0115] FIG. **4I** illustrates a detailed view of a portion of the cross-sectional view of FIG. **4A**, in accordance with an embodiment of the present disclosure. FIG. **4I** illustrates magnetic safety gate

latch assembly **100** in an unlocked position, i.e., a face of magnet **16** is illustrated parallel to the plane of FIG. **4I** and facing away from magnetic latch pin **12**. FIG. **4I** better illustrates placement of spring **30** inside magnetic latch pin guide **13**, concentrically encircling magnetic latch pin **12**. Magnetic latch pin **12** includes a flanged portion **53** located at a distal end of magnetic latch pin **12**, distal from magnet **16**. One end of spring **30** pushes against flanged portion **53**, and the other end of spring **30** pushes against a shoulder portion **55** of the interior of magnetic latch pin guide **13**. In the unlocked position of assembly **100**, spring **30** will have pushed flanged portion **53** to a distal end of magnetic latch pin guide **13**. In a locked position of assembly **100** (not illustrated), magnetic latch pin **12** will be magnetically attracted toward magnet **16**, thus forcing spring **30** to be relatively compressed. The potential energy stored in spring **30** by the compression will tend to force magnetic latch pin **12** into an unlocked position once the magnetic attraction to magnet **16** is disrupted.

[0116] FIG. **4I** further illustrates a flanged portion **54** of magnet housing **22**. Flanged portion **54** mates with bottom tube cover **10**. The mating of flanged portion **54** and bottom tube cover **10** prevents magnet housing **22** from moving vertically as twist drive shaft **18** is moved up and down by the user, without preventing twist drive **21** from rotating around a vertical axis. A partially exploded view is shown in FIG. **14**.

[0117] In an alternate embodiment (not illustrated), a spring within magnetic latch pin guide **13** may be fixedly attached to an interior end face of magnetic latch pin guide **13** and a facing surface of flanged portion **53**. The spring may be sized such that in a state of the spring that is neither compressed nor stretched, magnetic latch pin **12** may be in an unlocked state when there is no magnetic attraction between magnetic latch pin **12** and magnet **16**. When a magnetic attraction is introduced between magnetic latch pin **12** and magnet **16**, pulling magnetic latch pin **12** into a locked state, the spring may be stretched. Once the magnetic attraction is removed, the spring may compress and pull magnetic latch pin **12** back into an unlocked state.

[0118] In an alternate embodiment (not illustrated) if magnetic latch pin **12** itself is a magnet, a spring within magnetic latch pin guide **13** may be sized and positioned (e.g., within magnetic latch pin guide **13** between flanged portion **53** and a distal end of magnetic latch pin guide **13**) such that in a state of the spring that is neither compressed nor stretched, magnetic latch pin **12** may be in a locked state when there is no magnetic repulsion between magnetic latch pin **12** and magnet **16**. When a magnetic repulsion is introduced between magnetic latch pin **12** and magnet **16** to force magnetic latch pin **12** into an unlocked state, the spring may be compressed. Once the magnetic repulsion is removed, the spring may decompress and push magnetic latch pin **12** back into a locked state.

[0119] FIG. **5A** illustrates a front, right, and above oblique view of an interior portion of magnetic safety gate latch assembly **100**, in accordance with an embodiment of the present disclosure. FIG. **5A** illustrates elements visible in the plan views of FIGS. **3F** and **3H**. A portion of FIG. **5A** is marked as portion “L”. FIG. **5B** illustrates a detailed view of portion L in a closed (i.e., locked) position. In the closed position, an end of magnet **16** may be facing toward magnetic latch pin **12**, thereby attracting magnetic latch pin **12** into a latch groove.

[0120] FIG. **5C** illustrates a front, right, and above oblique view of an interior portion of magnetic safety gate latch assembly **100**, in accordance with an embodiment of the present disclosure. FIG. **5C** illustrates elements visible in the plan views of FIGS. **4F** and **4H**. A portion of FIG. **5C** is marked as portion “M”. FIG. **5D** illustrates a detailed view of portion M in an open position. Magnet **16** has been turned 90 degrees compared to the configuration of FIG. **5B**. Top lid **5** is lifted in order to put assembly **100** into an open (i.e., unlocked) position by spinning magnet **16** such that magnet **16** disengages with magnetic latch pin **12**. In the open position, an end of magnet **16** may be facing away from magnetic latch pin **12**, thereby not attracting magnetic latch pin **12** into a latch groove. In other embodiments (not illustrated), if magnetic latch pin **12** is a permanent magnet, magnet **16** may be turned 180 degree, thereby actively repelling magnetic latch pin **12**.

[0121] FIG. 5E is a cross-sectional top plan view in a horizontal plane of a magnetic safety gate latch system in a closed position, in accordance with an embodiment of the present disclosure.

[0122] FIG. 6 illustrates a process 600 in accordance with an embodiment of the present disclosure. Process 600 begins with step 601, at which a lifting mechanism such as pool latch lid 5 is lifted in order to produce a linear motion (e.g., in a vertical axis) of a component such as twist drive shaft 18.

[0123] Next, process 600 transitions to step 603, at which the linear motion is transformed into a rotational motion, such as a twisting motion of twist drive 21.

[0124] Next, process 600 transitions to step 605, at which a magnet (e.g., magnet 16) is rotated by use of the rotational motion, in order to break a magnetic attraction between the magnet and a ferromagnetic pin, e.g., magnetic latch pin 12. Alternatively, step 605 may be described as breaking a magnetic attraction between the magnet and the ferromagnetic pin by rotation of the magnet.

[0125] Next, process 600 transitions to step 607, at which the ferromagnetic pin is retracted in order to unlock the gate. For example, a force to retract the pin may be supplied by a spring (e.g., spring 30).

[0126] FIG. 7A is an interior front, right and above oblique view of embodiment 700 of a magnetic safety gate latch system in a closed (i.e., locked) position. A lower portion of embodiment 700 is marked as detail “A”, and is shown in greater detail in FIG. 7B. Embodiment 700 may be operable to rotate magnet 16 away from magnetic latch pin 12 in a different way than embodiment 100 of FIG. 1. In contrast to usage of a hinged coupling of lid 5 in embodiment 100 in order to lift up twist drive shaft 18, embodiment 700 rigidly couples lid 705 to a top end of shaft 718. Shaft 718 extends from near a top portion of embodiment 700 to near a lower portion of embodiment 700. Shaft 718 includes a major axis oriented substantially vertically. Shaft 718 is manually rotatable around the major axis, by turning lid 705. Lid 705 may be loosely coupled to pool latch tube 2, e.g., by resting on the top of pool latch tube 2, or on lock housing 803 surrounding lock 802, when lid 705 is not under active manual control. FIG. 12 illustrates a cross-sectional view of lid 705 loosely coupled to lock housing 803 by resting on top of lock housing 803. Lid 705 and lock housing 803 are described below in further detail with respect to FIG. 8A.

[0127] A lower end of shaft 718 may be rigidly coupled to a shaped base 752. Shaped base 752 is illustrated in FIGS. 7A and 7B as having a square cross-sectional shape in a plane perpendicular to the major axis of shaft 718. Other cross-sectional shapes of shaped base 752 may be used, such as triangular, hexagonal, toothed, and so forth.

[0128] Shaped base 752 may be loosely coupled to magnet housing 722, which in turn houses magnet 16, when embodiment 700 is in a closed position. The loose coupling allows for shaft 718 to be moved vertically relative to housing 722. The loose coupling may include shaped base 752 merely resting on a cooperating interior surface of magnet housing 722 by force of gravity. In some embodiments as illustrated in FIG. 13, a spring 1301 may be used to help keep magnet housing 722 in a preferred position as shaped base 752 is moved up or down.

[0129] An upper wall of magnet housing 722 may include a shaped aperture 754. At least a portion of shaped aperture 754 may include a circumferential edge that is matched to shaped base 752, and may cooperatively engage with shaped base 752 when shaft 718 is lifted up.

[0130] FIG. 8A is an interior front, right and above oblique view of embodiment 800 of a magnetic safety gate latch system in an open (i.e., unlocked) position. A lower portion of embodiment 800 is marked as detail “B”, and is shown in greater detail in FIG. 8B. Embodiment 800 illustrates lid 705 having been lifted up or elevated, e.g., by a person attempting to open a gate attached to the safety gate latch system. Lifting of lid 705 in turn lifts shaft 718 coupled to lid 705, and lifts shaped base 752 coupled to shaft 718.

[0131] In usage, as lid 705 is lifted (comparing FIG. 8A to FIG. 7A), lid 705 may be rotated around an axis parallel to the major axis of shaft 718, such that shaped base 752 fits at least partially into aperture 754. A vertical mechanical stop may be provided in order to prevent excessive vertical

movement that would cause shaped base **752** to pass entirely through aperture **754**. For example, the mechanical stop may be a lip along an upper portion of aperture **754**, or may be a tapered shape of shaped base **752** (e.g., a truncated pyramid) such that an upper portion of shaped base **752** fits within aperture **754** but not a lower portion, or may be a stop coupled to lid **705** or shaft **718** to prevent excessive vertical movement, and so forth. Fastener **735** prevents magnet housing **722** itself from being lifted up, while still allowing magnet housing **722** to rotate, e.g., fastener **735** may include a ball bearing.

[0132] Shaped base **752** may be sized such that it can fit snugly into at least a portion of aperture **754** without excessive “play”. Play facilitates fitting shaped base **752** into aperture **754**, but excessive play may risk causing a user to perceive embodiment **800** as being poorly designed or manufactured. For example, a play of less than ± 5 degrees of rotation of lid **705** around a vertical axis may be deemed to be acceptable.

[0133] Aperture **754** may have a circular shape if shaped base **752** has a shape of a truncated cone. Such an embodiment may not need play. However, a circular aperture **754** without additional surface features to increase a mechanical engagement of circular aperture **754** with shaped base **752** would be less desirable since it would rely upon friction to rotate magnet housing **722** when shaft **718** rotates. In order to increase the engagement of base **752** with magnet housing **722** and help prevent slippage for a circular aperture **754**, cooperating surfaces of base **752** with magnet housing **722** may include matching or interlocking non-smooth surface features (e.g., similar to a bevel gear). In contrast, non-circular shapes of aperture **754** and shaped base **752** substantially always employ a positive engagement between them in order to rotate magnet housing **722** when shaft **718** rotates.

[0134] In other embodiments, aperture **754** may be only large enough to allow shaft **718** to pass through an upper wall of magnet housing **722**. In this embodiment, aperture **754** may have a circular shape. The upper wall may include ridges, tabs or the like on a surface facing shaped base **752**. Shaped base **752** then may include cooperating ridges, slots, or the like on a surface facing the upper wall of magnet housing **722**. Engagement of shaped base **752** with magnet housing **722** would then be via the respective cooperating ridges or the like, rather than through respective cooperating circumferential surfaces.

[0135] Once shaped base **752** fits into or couples with aperture **754**, lid **705** may be rotated approximately ± 90 degrees, while keeping lid **705** in an elevated position. Doing so will cause magnet housing **722** to rotate by about the same amount (to within an angular tolerance determined by the play), and cause magnetic latch pin **12** to disengage from magnet **16**, and thus unlock the gate. A rotational mechanical stop may be provided to limit rotation of lid **705** to within about ± 90 degrees. When locking the gate from an unlocked state, these steps may be repeated with the exception of rotating lid **705** in an opposite direction. Other angular rotations also may be used (e.g., 45 degrees), so long as in a rotated position the magnetic attraction force between magnetic latch pin **12** and magnet **16** is sufficiently attenuated to be unable to overcome the repulsive force of spring **30**.

[0136] In some embodiments, an optional lock **802** may be provided. Lock **802** may prevent the gate from being locked or unlocked except by an authorized person. In some embodiments, lock **802** may be exposed only when lid **705** is at least partially lifted up. When locked, lock **802** may operate by, e.g., preventing rotation of shaft **718**, or preventing sufficient vertical motion of lid **705** to cause shaped base **752** to couple with aperture **754** and/or the upper wall of magnet housing **722**. Lock **802** may be at least partially encircled and held in place by lock housing **803**.

[0137] FIG. **9** illustrates a method **900** to operate a magnetic safety gate latch assembly of FIGS. **7A-7B** or **8A-8B**, in accordance with an embodiment of the present invention. Method **900** begins at step **901**, at which a lid (e.g., lid **705**) rigidly coupled to a shaped base (e.g., shaped base **752**) is lifted, e.g., lifted by a person wishing to unlock the assembly.

[0138] Next, at step **903**, once the shaped base is lifted by a sufficient amount, the shaped base

engages with a magnet housing (e.g., magnet housing **722**). The nature of the engagement is such that a rotation of one (e.g., the shaped base) causes the other (e.g., the magnet housing) also to rotate. For example, the engagement may be a result of a physical feature of the shaped base (e.g., a circumferential shape, a surface knurling, etc.) mating with a complementary physical feature of the magnet housing (e.g., a circumferential shape of a matching aperture, a knurling on the surface of the magnet housing, etc.).

[0139] Next, at step **905**, the lift mechanism is rotated in order to rotate the magnet housing.

[0140] Next, at step **907**, once the magnet housing has been rotated by more than a threshold amount, a magnetic force between a magnet (e.g., magnet **16**) in the magnet housing and a ferromagnetic latch pin (e.g., magnetic latch pin **12**) is changed. For example, an attractive magnetic force between the magnet and the ferromagnetic latch pin may be lessened sufficiently to allow the magnetic latch pin to retract away from the magnet **16** under the force of a spring.

Conversely, if the magnetic latch pin itself is a latch pin magnet that is oriented normally to be pushed toward (or be attracted to) the magnet housing, then rotating the housing may cause a repulsive magnetic force from the magnet in the magnet housing to repel the latch pin magnet.

[0141] Next, at step **909**, a balance of magnet force and spring force causes the ferromagnetic latch pin to retract, in order to unlock the magnetic safety latch assembly.

[0142] Though the above embodiments are described with reference to a fence gate system and assembly, embodiments of the present disclosure are intended to cover any fence assembly having one or more uprights.

[0143] When a gate assembly (e.g., latch assembly **100**) is correctly installed, the gate and latch pin housing will be centered as shown in FIG. **10A** and FIG. **10B**. However, over time the gate may sag and the latch pin housing (or latch pin guide **13**) may be below a center position of latch groove **50** in bottom cover **10**, as shown in FIG. **10C** and FIG. **10D**, which without correction or adjustment could result in the gate being difficult to latch, or may require a user to lift up manually on the gate in order to close the gate. Without adjustment of the gate or latch pin housing, the gate will continue to sag to a position shown in FIG. **10E**, and eventually the gate may not close at all without a lifting effort by the user. Such a lifting effort is not desirable because it prevents the gate from being self-closing, self-latching and/or self-locking, which is important to maintain safety around swimming pools or other attractive nuisance. Self-closing, self-latching and/or self-locking helps prevent unsupervised ingress to, or egress from, a monitored area such as a swimming pool area.

[0144] The problem described with respect to FIGS. **10A-10E** may be addressed by adding chamfers or the like to one or both of the latch pin cover and the bottom cover, in order to allow the gate still to be closed, latched and/or locked even when below center. The area where the chamfers are added is highlighted as detail “A” in FIG. **10D**, and detail “A” is illustrated in greater detail below with respect to FIGS. **11A** and **11F**.

[0145] FIG. **11A** is an exterior right plan view of a magnetic safety gate latch system in a misaligned position, with a portion marked as area “A”, while FIG. **11B** is an exterior rear plan view of a magnetic safety gate latch system in an aligned position.

[0146] Area “A” is shown in greater detail in FIG. **11F** as Detail A. Detail A illustrates a chamfered surface **1140**, which is angled with respect to a direction of travel of a gate when it is closed. In particular, as the gate is closed, chamfered surface **1140** allows hook **1141** to slide up chamfered surface **1140** so that hook **1141** can go into slot **1142**.

[0147] FIG. **11C** is an exterior left plan view of a magnetic safety gate latch system in an aligned position, with a portion marked as area “B”. Area “B” is shown in greater detail in FIG. **11G** as Detail B. As illustrated in FIG. **11G**, a slot **1143** may be provided in order to allow for easier access to a screw control for horizontal adjustment, without a need to remove a post cover (e.g., pool latch tube bottom cover **10**).

[0148] FIG. **11D** is an exterior front plan view of a magnetic safety gate latch system in a mis-

aligned position, marked with cut plane C-C, and FIG. 11E is a cross-sectional right plan view in cut plane C-C of a magnetic safety gate latch system in a mis-aligned position, with a portion marked as area “D”.

[0149] Area “D” is shown in greater detail in FIG. 11H as Detail D. As illustrated, the gate is sagging, as evidenced by hook **1141** being lower than slot **1142**. This assumes the post to which magnet housing **22** is coupled to is itself relatively stable and not sagging, compared to the gate. However, if the post is susceptible to settling or sagging over time, such that a misalignment of hook **1141** and slot **1142** may occur in other directions than that depicted in FIG. 11H, then additional chamfered surfaces may be provided around more of the circumference of hook **1141** and/or slot **1142**.

[0150] FIG. 11H illustrates addition of a vertical adjustment screw **1150**, used to adjust a vertical positioning of the latch body housing formed by lock pin base cover **11** and pool latch cover **14**, relative to base bracket **17**. Vertical adjustment screw **1150** operates together with screw retainer **1151** and square nut **1152**. In operation, if the gate begins to sag, turning screw **1150** (e.g., clockwise) will lower the latch body housing will lower the latch body housing and re-align gate hook **1141** with receiving post slot **1142**.

[0151] FIG. 11I is an exterior front plan view of a magnetic safety gate latch system in an aligned position, marked with cut plane E-E, and FIG. 11J is a cross-sectional right plan view in cut plane E-E of the magnetic safety gate latch system in an aligned position, with a portion marked as area “F”. Area “F” is shown in greater detail in the cross-sectional view of FIG. 11L. FIG. 11L illustrates positioning of the latch body housing after vertical adjustment screw **1150** had been used to restore alignment of hook **1141** with receiving post slot **1142**. In some embodiments, up to about 0.5 inches of adjustment end-to-end may be provided by turning vertical adjustment screw **1150** by a full amount.

[0152] FIG. 11K is an exterior right plan view of a magnetic safety gate latch system in a mis-aligned position, with a portion marked as area “G”. Area “G” is shown in greater detail in FIG. 11M. The view of FIG. 11M is from an external view, but is otherwise similar to the cross-sectional view of FIG. 11L.

[0153] Vertical adjustment screw **1150** can be turned with a screwdriver, with a result as shown in Detail F in FIG. 11L. This adjustment will lower the latch body on the post and allow latch pin **12** on the gate to be centered with latch groove **50** on the post. This is an easier adjustment than an alternative adjustment of centering by moving the latch pin housing higher on the gate or removing the latch body on the post and lowering the latch base.

[0154] FIG. 15A is an exterior left plan view of a magnetic safety gate latch system shown in detail in FIG. 13, and is marked with cut plane N-N. The system of FIG. 15A includes a lid **1505** similar to lid **705** shown in FIG. 7A.

[0155] FIG. 15B is a cross-sectional front plan view in cut plane N-N of a magnetic safety gate latch system. FIG. 15B includes an illustration of spring **1301**, shown in greater detail in FIG. 13.

[0156] FIG. 16A is an exterior front plan view of the magnetic safety gate latch system shown in FIG. 15A, and which is shown in detail in FIG. 13. FIG. 16A is marked with cut plane 0-0.

[0157] FIG. 16B is a cross-sectional right plan view in cut plane O-O of the magnetic safety gate latch system shown in FIG. 16A.

[0158] Although the present invention has been described with reference to exemplary embodiments, it is not limited thereto. Changes and modifications may be made to the preferred embodiments of the present invention and such changes and modifications may be made without departing from the spirit of the present invention. The claims are intended to cover all such equivalent variations as fall within the spirit and scope of the present invention.

[0159] To avoid unnecessarily obscuring the present invention, the preceding description omits well known structures and devices. These omissions are not to be construed as a limitation of the scope of the present invention. Specific details are set forth by use of the embodiments to provide

an understanding of the present invention. However, the present invention may be practiced in a variety of ways beyond the specific embodiments set forth herein.

[0160] A number of embodiments of the present invention may be practiced. It is possible to provide for some features of the present invention without providing for others.

[0161] The present invention, in various embodiments, configurations, and aspects, includes components, methods, processes, systems and/or apparatus substantially as depicted and described herein, including various embodiments, sub-combinations, and subsets thereof. Those of skill in the art will understand how to make and use the present invention after understanding the present disclosure. The present invention, in various embodiments, configurations, and aspects, includes providing devices and processes in the absence of items not depicted and/or described herein or in various embodiments, configurations, or aspects hereof, including in the absence of such items as may have been used in previous devices or processes, eg., for improving performance, achieving ease and/or reducing cost of implementation.

[0162] The foregoing discussion of the present invention has been presented for purposes of illustration and description. It is not intended to limit the present invention to the form or forms disclosed herein. In the foregoing detailed description, for example, various features of the present invention are grouped together in one or more embodiments, configurations, or aspects for the purpose of streamlining the disclosure. The features of the embodiments, configurations, or aspects may be combined in alternate embodiments, configurations, or aspects other than those discussed above.

[0163] This method of disclosure is not to be interpreted as reflecting an intention the present invention requires more features than are recited expressly in each claim. Rather, as the following claims reflect, inventive aspects lie in less than all features of a single foregoing disclosed embodiment, configuration, or aspect. Thus, the following claims are hereby incorporated into this detailed description, with each claim standing on its own as a separate embodiment of the present invention.

[0164] Moreover, though the description of the present invention has included description of one or more embodiments, configurations, or aspects and certain variations and modifications, other variations, combinations, and modifications are within the scope of the present invention, eg., as may be within the skill and knowledge of those in the art, after understanding the present disclosure, without intending to publicly dedicate any patentable subject matter.

Claims

1. A method of operating a safety gate latch assembly, comprising: lifting a lid to produce a linear motion on a drive shaft; transforming the linear motion of the drive shaft into a rotational motion on a magnet housing, wherein the magnet housing includes a magnet; based on the rotational motion of the magnet housing, breaking a magnetic attraction between the magnet and a latch pin, causing a latch pin to move from a first position to a second position.
2. The method of claim 1, wherein the first position is a locked position and the second position is an unlocked position.
3. The method of claim 2, wherein in the locked position, attracting the latch pin toward the magnet.
4. The method of claim 1, further comprising engaging a twist drive with a portion of the magnet housing, wherein the twist drive is provided at a first end of the drive shaft; and wherein the transforming of linear motion of the drive shaft into rotational motion of the magnet housing is based on linear motion of the twist drive within an aperture of the magnet housing.
5. The method of claim 4, wherein the transforming of linear motion into rotational motion is based on linear motion of helically-threaded portion of the twist drive within an aperture of the magnet housing.

6. The method of claim 1, further comprising urging, using a spring, the latch pin into the second position.
7. The method of claim 1, further comprising urging, using a magnetic repelling force, the latch pin into the second position.
8. The method of claim 1, further comprising urging, using a magnetic attractive force, the latch pin into the first position.
9. The method of claim 1, wherein the magnet has a north and a south pole and the rotational motion of the magnet housing causes the magnetic poles of the magnet to rotate.
10. The method of claim 9, wherein the north pole and the south pole of the magnet are in a predetermined orientation within the magnet housing.
11. A safety gate latch assembly comprising: a lid coupled to hinge assembly; a drive shaft coupled, at a first end, to the lid; a twist drive coupled to a second end of the drive shaft; a magnet housing including a magnet having a predetermined orientation; wherein the magnet housing is configured to rotate, based on linear motion of the drive shaft, between a locked position and an unlocked position; and wherein in locked position a latch pin is urged at least partially through a latch groove.
12. The assembly of claim 11, wherein when the latch pin is at least partially through the latch groove the latch pin prevents a gate from moving relative to a fence post.
13. The assembly of claim 11, wherein the twist drive includes a helical thread and the helical thread is coupled to a portion of the magnet housing.
14. The assembly of claim 13, wherein the helical thread engages a portion of the magnetic portion such that linear motion of the twist drive is converted into rotational motion of the magnet housing.
15. The assembly of claim 14, further comprising a tab configured to prevent the magnet housing from rotating more than 180 degrees.
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