Dec. 29, 1936. H. F. KEIL 2,066,277

ELECTRICALLY RELEASABLE BOLT KEEPER

Filed Dec. 13, 1934 2 Sheets-Sheet 1

Fig. 1.

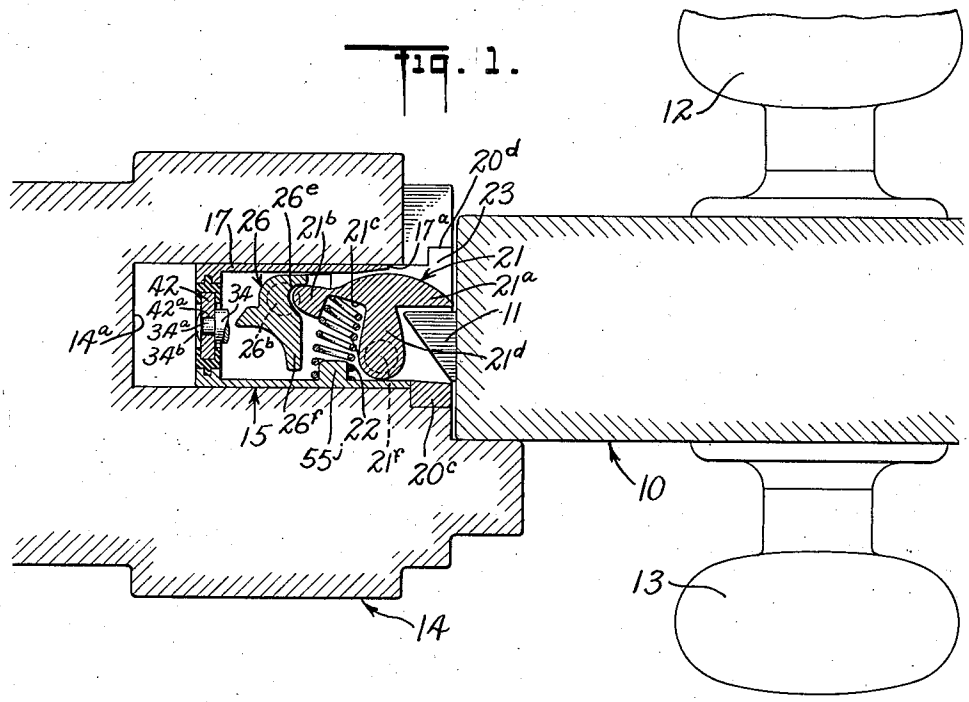
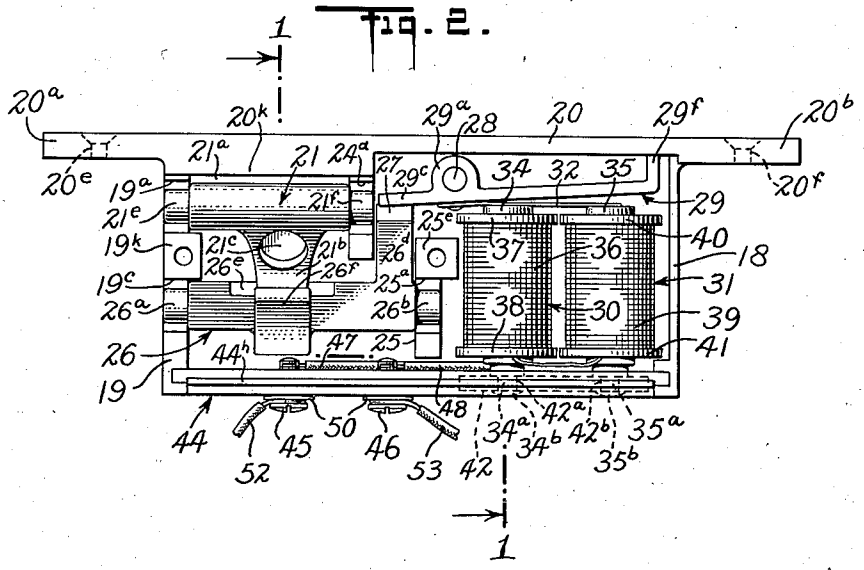


Fig. 2.



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Fig. 3.

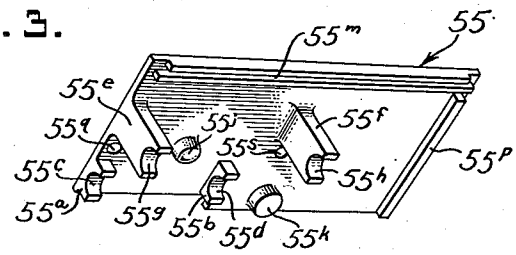


Fig. 4.

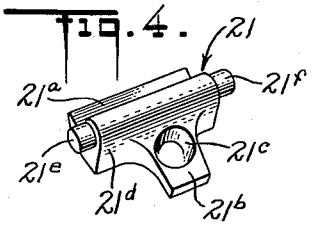


Fig. 5.

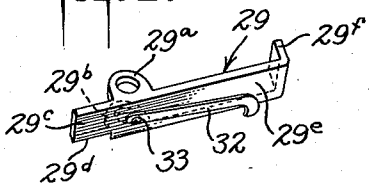


Fig. 6.

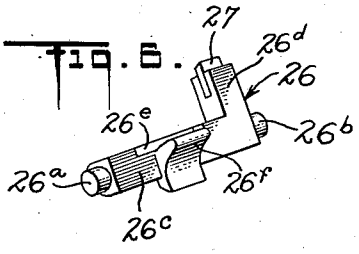


Fig. 7.

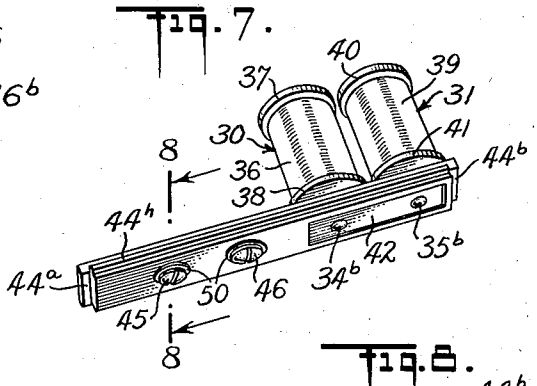


Fig. 8.

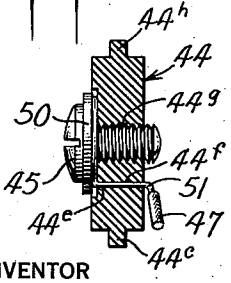
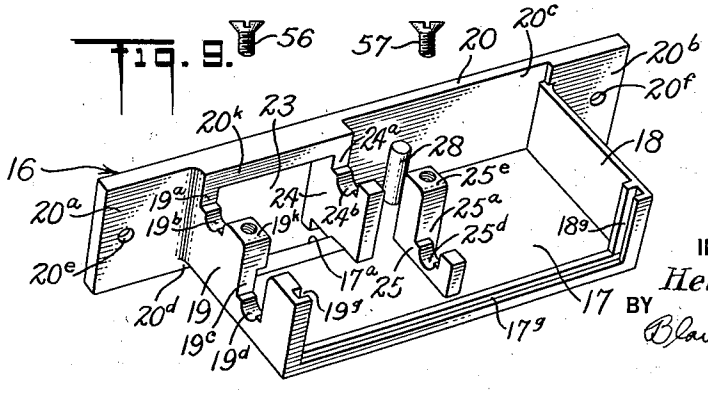


Fig. 9.



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UNITED STATES PATENT OFFICE

2,066,277

ELECTRICALLY-RELEASABLE BOLT KEEPER

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Application December 13, 1934, Serial No. 757,292

17 Claims. (Cl. 70—52)

This invention relates to so-called "electric door openers" and more particularly to the construction of a remotely controlled keeper for the bolt of a door lock or the like.

One of the objects of this invention is to provide a releasable keeper construction in which the cost of manufacture may be greatly reduced and the action and construction improved. Another object is to provide a releasable keeper construction in which the individual parts may be rapidly and inexpensively, but accurately, manufactured and quickly and inexpensively assembled. Another object is to provide a releasable keeper construction in which certain parts thereof may be die-cast with coacting or mating portions thereof shaped to mount and receive certain of the moving parts, but in such manner that the resultant assembly achieves, without requiring precision of fitting or, for that matter, without requiring any "fitting" thereof, proper and dependable interaction of the moving and other parts. Another object is to provide a construction of the above mentioned character in which the various parts may be genuinely standardized and inexpensively fabricated in standardized dimensions, shapes or designs, and capable, for example, of bringing about the intended and reliable coactions and interactions thereof.

Another object is to provide, in a construction of the above mentioned character, easily replaceable parts, whereby replacement or repairs may be quickly made. Another object is to provide, in a construction of the abovementioned character, an inexpensive, simple, but thoroughly practical and dependable, means of mounting the electrical or electro-magnetic parts thereof, and to permit the rapid and inexpensive incorporation thereof into the entire assembly. Another object is to provide a simple and practical method of carrying out objects such as those set forth above. Other objects will be in part obvious or in part pointed out hereinafter.

The invention accordingly consists in the features of construction, combinations of elements and arrangements of parts as will be exemplified in the structure to be hereinafter described, and the scope of the application of which will be indicated in the following claims.

In the accompanying drawings, in which I have shown one of various possible embodiments of the mechanical and electrical features of my invention,

Figure 1 is a horizontal sectional view through a door and door frame illustrative of a practical installation of a releasable keeper construction embodying my invention, the sectional view of the keeper construction as seen in Figure 1 corresponding to the cross section as seen along the line 1—1 of Figure 2;

Figure 2 is a plan view of the releasable keeper construction as it appears at a certain stage of its assembly, certain parts being accordingly not shown in Figure 2;

Figure 3 is a perspective or isometric view of a keeper plate and related integral parts, the parts of Figure 3 being some of those that are omitted from Figure 2;

Figure 4 is a perspective view of the keeper per se;

Figure 5 is a perspective view of an armature which comes under the control of the electromagnetic means shown in Figure 7 and is adapted to control the release of the keeper of Figure 4;

Figure 6 is a perspective view of a lever through which the armature of Figure 5 controls the keeper of Figure 4;

Figure 7 is a perspective view of the electromagnetic sub-assembly;

Figure 8 is a vertical sectional view on an enlarged scale as seen along the line 8—8 of Figure 7; and

Figure 9 is a perspective or isometric view of the main portion of the casing and related parts for receiving and for coacting with the parts shown in Figures 3 to 7 inclusive.

As conducive to a clearer understanding of certain features of my invention, reference might first be made to Figure 1 in which I have indicated at 10 a door or the like provided with any suitable bolt mechanism, usually of the latch-bolt type, and hence provided with a spring-projected latch bolt 11 operable from the inside of the door, as by the door knob or other suitable place indicated at 12, but not operable from the exterior of the door, as by the door knob or other device indicated at 13, excepting that the latch bolt 11 may be withdrawn from the outside of the door 10 by any suitable key and key-controlled mechanism (not shown).

The door swings into closed position relative to any suitable door jamb or frame or wall 14, the spring-opposed latch bolt 11 projecting in back of a keeper which may be retracted from a remote point within the structure to permit the door 10 to be opened from the outside thereof even though the latch bolt 11 can not be retracted from the exterior of the door.

Constructions embodying a releasable or retractable keeper, usually electro-magnetically controlled, as heretofore constructed are in a

large measure characterized by crudeness and cumbersomeness of construction and assembly, and principally by increased cost of manufacture due to the repeated cut-and-try methods of assembly that are employed due to the character of the construction itself. For example, the parts, as heretofore constructed, require the machining of certain parts or portions thereof but precision of machining can not effectively be carried out and as a result, when these devices are assembled in accordance with past practice, parts thereof have to be repeatedly taken out, filed off or ground, other parts touched up or filed or ground, reassembly effected and, if that reassembly does not achieve operative results, one or more or several or more parts are again taken out of the mechanism, again touched up, ground, filed or what not, and thus a finally operative assembly is hoped to be achieved.

Furthermore, in such prior constructions and methods of procedure considerable spoilage of parts results, and the cost of manufacture thus additionally increased. Furthermore, parts that are subjected to greatest wear or that have to bear severe strains and that are usually hardened are often times permanently deteriorated, during the grinding or filing thereof, by the resultant softening thereof.

One of the dominant aims of this invention is to effectively avoid such disadvantages and deficiencies as those noted above, and to provide a remotely controlled retractable keeper construction and a mode of construction and assembly thereof that will materially decrease the cost of manufacture while insuring the production of a far superior mechanism or device than has heretofore been possible.

Accordingly, and again referring to Figure 1, I first provide a casing generally indicated at **15** adapted to support and contain the working parts of the mechanism and shaped to be received within a suitable recess **14***a* in the wall or door frame **14** and adapted to present to the latch bolt **11** a releasable keeper. The casing **15** is preferably made of several parts, individually cast or preformed, and adapted to be interfitted and interrelated with each other, and accordingly a detailed description of the major one of these several parts may first be considered.

In Figure 9 is shown in perspective one of the casing parts and it is constructed and shaped, as is about to be described, so as to be capable of being die cast out of any suitable metal and, accordingly and preferably the construction, as shown in Figure 9, is unitary or integral throughout. This casing part, designated as a whole by the reference character **16**, has a bottom wall **17**, generally rectangular in shape, and at its opposite ends there are upstanding the end walls **18** and **19**; the casing part **16** also provides another wall of the outer casing and that may be termed the front wall **20** extended at its respective ends **20***a* and **20***b* as well as at its respective sides, as at **20***c* and **20***d*, beyond the dimensions of the bottom and end walls **17**, **18** and **19**, thereby to provide a peripherally flanged or extended front wall which, when the ultimate assembly is set into the hole **14***a* of wall **14** (see Figure 1) may overlap the open end of the hole **14***a* and may be utilized, as by suitable screws (not shown) passed through the holes **20***e* and **20***f* (Figure 9) and threaded into the wall **14**.

The casing part **16** (Figure 9) is also formed or shaped to receive or to coact with other parts of the mechanism, but in order better and more clearly to understand how the casing part **16** is constructed for these purposes, consideration of the special construction of these other parts and of a description thereof must first be had; accordingly, reference may now be made to Figure 4, in which is shown in perspective a keeper member, generally designated by the reference character **21**, and constructed and shaped for coaction with certain features of the casing part **16**.

The keeper member **21** is, in transverse cross-section, generally T-shaped, as is better shown in the cross-sectional view of Figure 1, and accordingly has an arm-like lateral extension **21***a* which is the effective keeper portion thereof adapted to coact directly with the latch bolt **11** and which has an oppositely directed arm-like portion **21***b* (Figure 1) provided with a socket or recess **21***c* for the reception of one end of an expansible helical spring **22**, the action and purpose of which will be later described. The vertical or upstanding portion **21***d* (Figure 1) of the keeper member **21** is provided at its ends (see Figure 4) with trunnions **21***e* and **21***f*, preferably of substantial diameter and of substantial dimension in an axial direction, in order to provide ample bearing surfaces and adequate strength during the operation and functioning of the keeper **21**, the trunnions **21***e* and **21***f*, with their coacting bearings later to be described, determining the axis about which the keeper **21** (see Figure 1) may pivot.

As is better shown in Figure 4, the keeper portion **21***a* of the keeper **21**, as well as the so-called vertical or upstanding portion **21***d* thereof, is of substantial dimension in the direction of the axis of the keeper **21**, that axis (see now Figure 1) being substantially parallel to the axis about which the door **10** swings, whereby the keeper **21** is made to present relatively broad parts or surfaces or portions to the latch bolt **11**, which may be of similar breadth or extent or less than that, as the latch bolt **11** slides inwardly (to the right in Figure 1) and moves downwardly (as viewed in Figure 1) during the door-closing operation or as the latch bolt **11**, when the keeper **21** is swung in counter-clockwise direction as viewed in Figure 1, slides against and past the broad end face of the keeper portion **21***a* thereof.

The front wall **20** (Figure 9) of the casing part **16** is provided with a rectangularly shaped opening **23** adjacent to which the keeper member **21** is mounted and through which the keeper portion **21***a* thereof is positioned for coaction with the latch bolt **11** (Figure 1), the bottom wall **17** (Figure 9) of the casing part **16** being cut away as at **17***a* throughout a width equivalent to the axial dimension of the portions **21***a* and **21***d* of the keeper **21** (Figure 4) and to a depth substantially equivalent to the amount which the latch bolt **11** (Figure 1) projects beyond the left-hand edge of the door **10**; this cut-away portion **17***a* of the bottom wall **17** is also apparent in Figure 1, from which it will be seen that, if the keeper member **21** is swung in counter-clockwise direction to disengage it from the latch bolt **11**, the recess or hole **23** and the recess **17***a* in the walls **20** and **17** of the casing part **17** (Figure 9) permit the free and unobstructed movement (upwardly as viewed in Figure 1) of the latch bolt **11** with the door **10** as the latter is swung in counter-clockwise direction.

Now the end wall **19** (Figure 9) of the casing part **16** is cut away or recessed as at **19***a*, and in the bottom of that recess there is formed a half-cylindrical bearing or bearing surface **19***b*. Extending parallel to the end wall **19** and aligned

with the other vertical wall of the aperture or recess 23 (Figure 9) is an inside upstanding wall portion 24 of the same height from the bottom wall 17 as is the end wall 19, wall portion or support 24 being recessed as at 24a, and in the bottom of the recess 24a there is formed a half-cylindrical bearing or bearing surface 24b coaxial with and of the same radius of curvature as the bearing 19b above described.

The spacing between the wall portions 19 and 24 is such that the keeper member 21 (Figure 4) is neatly receivable or received therebetween, trunnions 21e and 21f being received within the bearings 19b and 24b, respectively. Member 21, when thus slipped downwardly in between the wall portions 19 and 24 of Figure 9, thereby becomes related to the casing part 16 much as appears from Figure 2 and also Figure 1; as is better shown in Figure 2, the arm 21b of the keeper member 21 extends almost horizontally with the spring-receiving recess 21c facing upwardly.

At the same time the other arm portion or keeper portion 21a of member 21 virtually fills up the recess 23—17a (Figure 9) and is positioned to have certain of its parts, as already above described, exposed therethrough for ultimate coaction with the latch bolt 11.

End wall 19 is provided with another recess 19c whose vertical walls, like those of the recesses 19a and 24a above described, are parallel. The recess 19c is of greater depth than recesses 19a and 24a, and in its bottom it is shaped to provide a half-cylindrical bearing or bearing surfaces 19d.

Upstanding from the bottom wall 17 and parallel to the end wall 19 and, like the other parts, preferably cast integrally therewith, is a wall portion 25 recessed as at 25a and in the bottom thereof provided with a half-cylindrical bearing or bearing surface 25d, axially aligned with and preferably of the same radius of curvature as the bearing 19d in the end wall 19.

These half-bearings 19d and 25d receive the trunnions 26a and 26b of a lever member generally indicated at 26 in Figure 6.

Member 26, clearly shown in perspective in Figure 6, comprises in effect an L-shaped casting in the ends of the long arm 26c of which the trunnions 26a and 26b are formed and in the outer end of the short arm 26d of which there is secured a mechanical contact member 27. The member 27 is preferably of a metal that is well adapted to resist wear and may, for example, be made of hardened steel set into a slot in the end of the arm 26d and secured in place by a rivet or the like, but preferably where the lever member 26 is a casting, such as a die casting, the wear-resisting member 27 is first set into a die or mold and the member 26 cast about it.

The uppermost face of the long arm 26c, as viewed in Figure 6, is provided with a recess 26e (see also Figure 1) of sufficient extent in the direction of the length of the long arm 26c adequately to accommodate therein the extreme end of the arm portion 21b (Figures 4 and 1 and 2) of the keeper member 21.

Projecting substantially normally to the plane of the L-shaped lever 26 (Figure 6) and preferably cast or formed integrally therewith, is a lug 26f shaped substantially as appears best in Figures 6 and 1, and forming in effect a grip or handle which may be grasped between the forefinger and the thumb in order to facilitate setting the lever 26 into the casing part 16 (see Figure 9) and to bring the trunnions 26a and 26b into sitting relation with respect to the bearings 19d and 25d respectively, the lug or handle portion 26f permitting the lever 26 to be manipulated so as to bring its arm 26d into the space between the wall portions 24 and 25 (see Figures 9 and 2) and to bring the ledge bounding the recess 26e underneath the arm 21b (see Figure 1) of the keeper member 21.

Upstanding from the bottom wall 17 of the casing part 16 (Figure 9) and preferably cast integrally therewith, is a stud or post 28 positioned as is better shown in Figures 2 and 9, which is of slightly lesser height than the height of the end wall 18. This post 28 is to support and to serve as a pivot for an armature generally indicated by the reference character 29 and better shown in perspective in Figure 5. Armature 29 is made of any suitable magnetic material, preferably of sheet steel of appropriate thickness, and is shaped so as to be readily and easily stamped into the desired shape or form, as is better shown in Figure 5.

Accordingly, armature 29 is provided with two spaced ears 29a and 29b which are apertured to receive therethrough the stud 28 (Figure 9) and to pivot freely about the latter.

The ears 29a and 29b are spaced apart so that, when the armature 29 is dropped into the casing part 16 and its two spaced ears slipped over the pivot pin or stud 28, the latter is substantially accommodated within the space between the planes of the outside surfaces of the two ears, and it will be seen that the portion 29c of the armature 29 that extends to the left of the ears 29a and 29b is thus brought into coacting relation with the hardened steel insert 27 of the lever 26 (as is better shown in Figure 2). Moreover, referring now again to Figure 5, the lower side portion of the armature end 29c is cut away as at 29d so that, when the armature 29 is positioned on its stud 28, the steel insert 27 of the lever 26 is better and more compactly related to it for coactions later described. Preferably the end portion 29c of the armature 29 is hardened.

The portion 29e of the armature 29 (Figure 5) that extends to the right of the ears 29a and 29b is to coact with a suitable electro-magnetic means, preferably taking the form of two electro-magnets generally indicated at 30 and 31 in Figure 2, and constructed and mounted and related to the other parts in a manner about to be described, but when properly mounted and positioned a spring 32 (Figures 2 and 5) made preferably of a non-magnetic material such as brass or bronze and secured to the armature 29 as by a pin or rivet 33, rests against the exposed cores 34 and 35 (Figure 2) of the electro-magnets 30 and 31, respectively, and thus normally urges and holds the armature 29 (Figure 2) away from the cores 34 and 35.

The extreme right-hand end of the armature 29 is bent substantially at right angles to the portion 29e to provide an end part 29f which, when the armature 29 is supported by the stud 28 as shown in Figure 2, abuts against the inside face of the front wall 20 in the casing part 16 and thus limits the extent to which the spring 32 can force the armature 29 away from the magnet cores. Its normal position, or position of rest, is that shown in Figure 2, and when in that position the left-hand portion 29c thereof overlaps the hardened insert 27 in the short arm 26d of the lever 26, and thus acts as a stop to prevent swinging movement of the lever 26.

Considering now the mounting of the electro-magnets 30—31 and their assembly with respect

to the above described parts, it is first to be noted, referring now again to Figure 9, that the forward inside ends of the bottom wall **17** and end walls **18** and **19**, as viewed in Figure 9, are flanged or otherwise shaped to provide grooves **17***g*, **18***g*, and **19***g*, all connected as shown in Figure 9. These flanges or grooves are shaped moreover, as are the other features and portions of the casing part **16**, to facilitate die casting thereof.

As earlier above noted, the electro-magnetic means that is to act upon the armature **29** may, and preferably does, comprise two coacting electro-magnets **30**—**31**; these are shown in Figures 2 and 7. Electro-magnet **30** may comprise an iron core **34** and a winding **36** carried thereby between insulating disks **37**—**38**, suitably fixed thereto; and electro-magnet **31** may comprise an iron core **35** with a winding **39** thereon and held in place by end insulating disks **40**—**41**, suitably fixed or secured to the core **35**. Cores **34** and **35** (Figure 2) have extensions **34***a* and **35***a* of reduced diameters received respectively in appropriately spaced holes **42***a* and **42***b* (Figures 1, 2, and 7) in an iron or steel plate **42** molded into a member **44** made of any suitable solid dielectric material, such as fibre, bakelite, laminated bakelite, or the like. Any suitable means may be employed for preventing the reduced core ends **34***a* and **35***a* from going out of the holes **42***a* and **42***b*, respectively, of the inset member **42** and illustratively the extreme ends may be headed over, as at **34***b* and **35***b* respectively, much the same as a rivet may be expanded or headed over. By this means the cores, and hence the electromagnets **30**—**31**, are rigidly and dependably mounted onto the member **44** (Figure 7) and in appropriate spaced relation, it being noted that the assembly of these parts may be quickly and easily carried on and, moreover, free from cumbersome or annoying operations.

The electromagnets **30**—**31** (Figures 2 and 7) will be seen to be mounted adjacent the right-hand end of the insulating member **44** and appropriately spaced in the remaining or left-hand half portion of the insulating member **44** are provided terminal binding posts or binding screws **45** and **46**, to which the conductors **47** and **48** (Figure 2) leading from the windings **36** and **39** (which are preferably connected in series) are connected. This connection and a construction of the binding screws are preferably as shown in Figure 8, a description of which will suffice for both.

Accordingly, it will be seen that in the outer face of the insulating member **44** I provide a recess **44***e* between the bottom of which and a washer **50** is received the bared wire **51** of the conductor **47**, the latter being brought from the inside or rear face of the insulating member **44** through an aperture or hole **44***f* that is drilled or formed adjacent to the threaded hole **44***g* in which is threaded the threaded shank of the binding screw **45**.

When, therefore, the insulating member **44** with its electro-magnets **30** and **31** and terminal connectors **45** and **46** forming a sub-assembly or unit, as appears in Figure 7, is dropped or slid downwardly so that its ribs slide into and interengage the above-mentioned grooves in the casing part **16**, the latter will have added to it another closing wall, but at the same time the electro-magnets **30**—**31** become properly and appropriately related to the armature **29** (see now Figure 2) and the connecting screws **45**—**46** become part of the ultimate casing construction but (see Figure 2) positioned for access thereto externally, as for the connection thereto of the outside conductors **52** and **53**.

In the ultimate installation, therefore, the binding screws **45** and **46** (see now Figures 2 and 1) may be slightly backed off to permit the bared conductors to be hooked or wrapped around the shanks of the binding screws but in between the heads thereof and the washers **50**. When the binding screws **45** and **46** are tightened up the conductors related to each are securely clamped and thus dependable connections to the windings of the electro-magnets assured.

Though in the foregoing description it may be inferred that the sequence of assembly of the parts is such that the keeper **21** (Figure 4) must first be related to the casing part **16**, then the receiver **26** (Figure 6), then the armature **29** (Figure 5) and then the subassembly **30**—**31**—**44** (Figure 7), it is to be distinctly understood that that sequence is merely illustrative and has been adopted to achieve greater clarity of description. Any order or sequence of assembly that may be found more desirable than any other may be adopted and carried out. In any event, however, the accurately pre-formed or pre-dimensioned parts, when assembled to the casing part **16**, are, particularly due to the unique features of construction and arrangement described, capable, when the assembly is ultimately completed, of proper and dependable operation. Tedious time-consuming or laborious fitting, filing or grinding accompanied by cut-and-try methods and repeated assemblies and disassemblies are entirely avoided and, moreover, the assembly of the parts thus far described, requiring at the most only the sequential laying of the parts into the casing part **16**, is a matter of only a few seconds.

Having completed the assembly thus far, the ultimate casing will be seen to have been provided with all but one closing wall, and there remains to be assembled thereto and fixed in position the remaining closing wall which is to be juxtapositioned to the bottom wall **17** (Figure 9) of the casing part **16** and the construction of which is best shown in Figure 3, wherein it is designated by the reference character **55**.

This closing wall (Figure 3) is a plate-like member, generally rectangular in shape, and dimensioned to overlap the end walls **18** and **19** of the casing part **16** (Figure 9) and to overlap the end wall formed by the insulating member **44** (Figures 2 and 3), and to be interfitted with or to be overlapped by the front wall **20** (Figures 9 and 2).

At its end face the plate member **55**, also shaped and dimensioned to be readily die cast, has depending therefrom and integrally formed therewith two longitudinally spaced parts **55***a* and **55***b* provided with half-cylindrical bearing surfaces or bearings **55***c* and **55***d* respectively, these parts being shaped and spaced to be received respectively in the recesses **19***a* and **24***a* (Figure 9) of the wall portions **19** and **24** of the casing part **16**. The half-cylindrical bearing surfaces thereof close over the exposed portions of the trunnions **21***e* and **21***f* of the keeper member **21** that rests in the half-bearings **19***b* and **24***b* as above described, thus providing these trunnions with complete bearings of adequate size and dimensions for long, continued use.

Member **55** (Figure 3) also has depending therefrom and integrally formed therewith parts

55e and 55f shaped to provide half-cylindrical bearing surfaces or bearings 55g and 55h, respectively, and shaped, when member 55 is related to the casing part 16 (Figure 9) to telescope or fit into the recesses 19c and 25a in the wall portions 19 and 25, respectively. The half-bearings 55g and 55h (Figure 3) are thus brought down on to and over the trunnions 26a and 26b, respectively, that are already resting in the half-bearings 19d and 25d, and thus adequate and substantial bearings for the lever member 26 are provided and, when the plate member 55 is secured in position, lever member 26, just like keeper member 21, is fixed and held in assembled and operative relation to the other parts.

Again referring to Figure 3, the member 55 has depending therefrom and integrally formed therewith a stud or pin 55j, generally cylindrical in shape and proportioned with respect to the spring 22 (see Figure 1) to enter into one end of the latter and to be gripped thereby, thereby permitting the spring to be fixed to the member 55 (Figure 3) prior to the assembly of the cover member 55 to the casing part 16 (Figure 9).

Moreover, the stud or projection 55j (Figure 3) and hence the spring 22 (Figure 1) is so positioned that, when cover member 55 is assembled to the casing part 16, it is juxtaposed (see now Figure 1) to the recess 21c in the keeper member 21 into which the other or otherwise free end of the spring 22 is received. Thus the assembly of the spring 22 into operative relation to the moving parts of the mechanism is achieved simultaneously with the assembly of the cover member 55 to the rest of the casing.

Again referring to Figure 3, the end face of cover member 55 has depending therefrom and integrally formed therewith a stud or lug 55k which becomes juxtaposed to and just about rests upon the upper end of the stud 28 (Figure 9), about which the armature 29 pivots, the part 55k (Figure 3) being of greater lateral expanse than the face of the stud 28 (Figure 9) so that upward movement of the armature 29 along its stud 28 is prevented. Armature 29 is thus confined, by the bottom wall 17 (Figure 9) and by the projection 55k (Figure 3) against movement lengthwise of the stud 28, though permitted freely to pivot or swing about the latter within the limits earlier above described.

The cover member 55 (Figure 3) is provided along the forward edge of its end face as viewed in Figure 3 with two spaced flanges forming therebetween a groove or slot 55m within which the rib 44h (Figures 8 and 2) is received when the cover member 55 is related to the casing part 16, the insulating member 44 (Figures 7 and 8) being thus peripherally encased or interposed and interengaged by the grooves in the casing parts 16 and 55 which receive the peripheral ribs of the insulating member 44. The latter is thus not only dependably fixed in position and its magnets 30—31 likewise fixed in their relation to the other parts of the mechanism, but also is dependably and reliably reenforced by the metal casing parts 55 and 16 and reliably prevented from warping or becoming distorted.

The rear edge of the member 55 as viewed in Figure 3 is stepped or cut away as shown so that it will snugly interfit with the shape of the inside face of the wall 20 (Figure 9), the latter being thickened or enlarged as at 20k about the recess 23 therein. This interfitting prevents the cover member 55 from moving toward the left relative to the casing part 16 while a downwardly directed flange 55p (Figure 3) along the right-hand edge of the member 55 becomes seated to the left of the end wall 18 of the casing part 16 (Figure 9) and thereby prevents movement of the cover member 55 in a direction toward the right.

As the member 55 thus rests in interfitting relation with the casing parts 16 and 44, its end face is also engaged by the thickened or enlarged post members 19k and 25e, each of which is provided with a threaded hole as is clearly shown in Figure 9. With these threaded holes, holes 55q and 55s (Figure 3) register, the latter holes being countersunk externally of the cover plate 55 to receive screws 56 and 57 (Figure 9) which, when driven home, become threaded into the parts 19k and 25e and securely hold the cover member 55 and the parts held by the latter, all in assembled relation.

All of these operations of assembly are completed in but a minute fraction of the time that heretofore has been requisite in constructing so called "electric door openers" according to prior practice, a complete assembly being achievable in only a few seconds of time due to the unique structural features of the individual parts and due to the unique interrelation and coaction thereof and therebetween.

The thus completed device is now ready to be installed, for example, in the manner shown in Figure 1 and above already briefly described. The moving or movable parts, particularly the keeper member 21, the lever member 26 and the armature 29, normally assume the positions and interrelations shown in Figures 1 and 2; the end portion 29c of the armature 29 (Figure 2) overlies the insert 27 of the short arm 26d of the lever 26, confining it between itself and the bottom wall 17 of the casing. Lever 26 is thus virtually locked or held against swinging movement about the axis of its trunnions and hence holds the keeper member 21 (see now Figure 1) immovable in latch-bolt engaging position, due to the arm 21b being received within the recess 26e of the lever 26. Accordingly, the door 10 is held against being opened from the outside unless a key or the like is employed to withdraw the latch bolt 11.

If, however, the electro-magnetic means 30—31 is energized, armature 29 (see Figure 2) is swung in clockwise direction against the action of the spring 32 and thereby its end portion 29c is moved out of engagement with the member 27 (Figures 2 and 6) of the lever member 26, thereby freeing the latter for swinging movement about the axis of its trunnions and thereby also freeing the keeper member 21 (Figure 1) for swinging movement about the axis of its trunnions but in a counter-clockwise direction, as viewed in Figure 1. Normally the spring 22 coacts to hold members 21 and 26 in the position shown in Figure 1, but its holding action is yieldable; accordingly, with the electro-magnetic means 30—31 energized as above described, and if appropriate force is applied to the door 10 in door-opening direction, latch bolt 11, as the door 10 swings out of closing position, swings the keeper member 21 in counter-clockwise direction against the action of the spring 22 and as soon as the latch bolt 11 is moved out of engagement with the keeper portion 21a of the keeper member 21, spring 22 returns the keeper member 21 to its normal position, as shown in Figure 1, and likewise returns the lever member 26 to the positions shown in Figures 1 and 2, spring 32 (Figure 2) acting upon the ar-

mature 29, moving the latter and hence its end portion 29c, as soon as the electro-magnetic means 30—31 becomes deenergized, into interlocking engagement again with the part 27 of the lever member 26. Thus the parts are again restored to normal for a repetition of the cycle of operations just described.

Thus it will be seen that there has been provided in this invention a releasable or retractable remotely controlled keeper construction or so-called "electric door opener" in which the various objects hereinbefore set forth, together with many thoroughly practical advantages, are successfully achieved. It will be seen that construction costs may be vastly reduced; parts, such as the casing part 16 of Figure 9 or the parts shown in Figures 3, 4, and 6, may be uniformly and inexpensively constructed as by die casting and all of the parts inexpensively standardized as to dimensions, proportions and the like; accordingly, assembly or disassembly, as well as replacement of parts where necessary, may be quickly and inexpensively achieved. Furthermore, it will be seen that the crude, expensive and troublesome constructions and practices of the prior art may be dependably disposed with, and numerous thoroughly practical advantages successfully achieved. Further, it will be seen that the resultant construction is strong, rugged and durable, is substantially fool-proof, and is well adapted to meet the conditions of hard, practical use.

As many possible embodiments may be made of the above invention, and as many changes might be made in the embodiment above set forth, it is to be understood that all matter hereinbefore set forth, or shown in the accompanying drawings, is to be interpreted as illustrative and not in a limiting sense.

I claim as my invention:

1. In construction of the character described, in combination, a casing having means for movably supporting therein a keeper, said casing having at least two walls separable therefrom, said casing being adapted to contain therein mechanism, including an armature, adapted to hold said keeper against movement and upon actuation to permit movement thereof, one of said walls being of solid dielectric material and having mounted thereon and facing inwardly of said casing and toward said armature, electromagnetic means for coaction with said armature and having mounted upon the exterior face thereof terminal connecting means, and means whereby, when said other wall is assembled to said casing, said solid dielectric wall is held in assembled relation and said electromagnetic means is cooperatively positioned with respect to said armature.

2. In construction of the character described, in combination, a casing having means for movably supporting therein a keeper, said casing having at least two walls separable therefrom, said casing being adapted to contain therein mechanism, including an armature, adapted to hold said keeper against movement and upon actuation to permit movement thereof, one of said walls carrying electro-magnetic means for coaction with said armature, and means whereby said one wall is interfitted with the rest of said casing and the other of said walls is interfitted with both, said electromagnetic means being thereby positioned and supported for cooperation with said armature.

3. In construction of the character described, in combination, a casing generally of rectangular cross section and adapted for having movably mounted therein a keeper together with mechanism for holding said keeper against movement and which mechanism is adapted, when actuated, to release said keeper, said mechanism including an armature, said casing comprising at least three separable parts, one part including a bottom wall and two end walls, said walls being grooved adjacent one end thereof, a second part comprising a side wall member interfitted with the aforesaid grooved walls, said side wall carrying means which, when said side wall is assembled to said first-mentioned part, is operatively related to said armature, and the third part comprising a wall juxtaposed to said bottom wall of said first part and engaging said side wall to hold the latter in said grooved other walls.

4. In construction of the character described, in combination, a casing generally of rectangular cross section and adapted for having movably mounted therein a keeper together with mechanism for holding said keeper against movement and which mechanism is adapted, when actuated, to release said keeper, said mechanism including an armature, said casing comprising at least three separable parts, one part including a bottom wall and two end walls, a second part comprising a side wall having means for interfitting it with the walls of said first part, and a third part comprising a closing wall juxtaposed to the bottom wall of said first part, one of said last two mentioned parts carrying electro-magnetic means positioned, when the wall carrying it is assembled to said first part, to coact with said armature, and means whereby said third part holds said second part in assembled relation to said first part.

5. In construction of the character described, in combination, a casing generally of rectangular cross section and adapted for having movably mounted therein a keeper together with mechanism for holding said keeper against movement and which mechanism is adapted, when actuated, to release said keeper, said mechanism including an armature, said casing comprising at least three separable parts, one part including a bottom wall and two end walls, said first part carrying a stud and said armature having bearing means for the reception of said stud, thereby pivotally to support said armature, a second part comprising a side wall interfitted with at least two walls of said first part and carrying electro-magnetic means which, when said side wall is assembled to said first part, is positioned for coaction with the armature carried by said stud, and a third part provided with means for securing it to said first part and overlapping said stud and said second part.

6. In construction of the character described, in combination, a casing generally of rectangular cross section and adapted for having movably mounted therein a keeper together with mechanism for holding said keeper against movement and which mechanism is adapted, when actuated, to release said keeper, said mechanism including an armature, said casing having a bottom wall member and an attachable opposed closing wall member, a stud fixedly related to said bottom wall member, said armature member having bearing means for the reception of said stud, whereby said armature may be assembled to said stud, and being thereby pivotally mounted on the latter, said mechanism including electro-magnetic

means for coaction with said armature, and means whereby said closing wall member, when attached to said casing, holds said armature in assembled relation to said stud.

7. In construction of the character described, in combination, a casing generally of rectangular cross section and adapted for having movably mounted therein a keeper together with mechanism for holding said keeper against movement and which mechanism is adapted, when actuated, to release said keeper, said mechanism including an armature, said casing comprising a casing part supporting said mechanism and detachable wall members to complete said casing, said casing part having a stud for detachably supporting said armature, one of said detachable wall members carrying electro-magnetic means which, when its wall member is assembled to said part, is positioned for coaction with said armature, and another of said detachable wall members having means for holding said armature in assembled relation to said stud.

8. In construction of the character described, in combination, a casing having opposed wall members, one of which is separable from the other, each of said wall members carrying complementary bearing means which, when said wall members are assembled, form complete bearing means, a keeper having means receivable in one of said bearing means, the bearing means being completed by said complementary bearing means when said separable wall member is put in place, and means securing said wall member to said casing, whereby said keeper is mounted for pivotal movement and is held in assembled relation to said casing.

9. In construction of the character described, in combination, a casing having opposed wall members, one of which is separable from the other, each of said wall members carrying complementary bearing means which, when said wall members are assembled, form complete bearing means, a keeper having means receivable in one of said bearing means, the bearing means being completed by said complementary bearing means when said separable wall member is put and secured in place, whereby said keeper is mounted for pivotal movement and is held in assembled relation to said casing, said opposed wall members having additional complementary bearing means which, when said wall members are assembled, form complete bearing means, a member coacting with said keeper and adapter, upon pivoting movement, to prevent or permit pivoting movement of said keeper and having a means engageable in one of said additional complementary bearing means, another of said additional complementary means completing the bearing means therefor when said separable wall member is put in place whereby it is held in assembled relation to said casing and to said keeper, and means for securing said separable wall member to the rest of said casing and thereby holding said keeper and said coacting member in coacting and assembled relation.

10. In construction of the character described, in combination, a casing having opposed wall members, one of which is separable from the other, each of said wall members carrying complementary bearing means which, when said wall members are assembled, form complete bearing means, a keeper having means receivable in one of said bearing means, the bearing means being completed by said complementary bearing means when said separable wall member is put and secured in place, whereby said keeper is mounted for pivotal movement and is held in assembled relation to said casing, said opposed wall members having additional complementary bearing means which, when said wall members are assembled, form complete bearing means, a member coacting with said keeper and adapted, upon pivoting movement, to prevent or permit pivoting movement of said keeper and having a means engageable in one of said additional complementary bearing means, another of said additional complementary means completing the bearing means therefor when said separable wall member is put in place whereby it is held in assembled relation to said casing and is cooperatively related to said keeper, a pivoting armature coacting with said member to prevent or to permit movement thereof, one of said wall members having a stud and said armature having bearing means receivable on to said stud, electro-magnetic means for controlling said armature, said electromagnetic means being carried by said casing in such a position that it and said armature are cooperatively assembled upon said armature having its bearing means related to said stud, and means whereby said opposed wall members, when assembled, hold said armature in assembled relation to said stud.

11. In construction of the character described, in combination, a one-piece casing part for an electric keeper-release mechanism and adapted to be die cast, said part comprising bottom walls and side walls integrally formed and having integrally formed therewith upwardly directed spaced bearing means into which, upon assembly, trunnioned keeper and keeper-controlling members may be set.

12. A sub-assembly for forming part of the casing and mechanism of an electric keeper-releasing device, said sub-assembly comprising, in combination, a casing wall member made of insulating material having metallic means embedded therein and having mounted on one face thereof the electro-magnetic means forming part of said mechanism and having exposed on the other face thereof terminal connecting means that is in electrical connection with the winding of said electro-magnetic means.

13. A sub-assembly for forming part of the casing and mechanism of an electric keeper-releasing device, said sub-assembly comprising, in combination, a casing wall member dimensioned to form part of the casing and having electromagnetic means mounted thereon, said electromagnetic means having magnetic core means a part of which is embedded in said wall and said wall member carrying terminal connecting means electrically connected to the winding of said electro-magnetic means.

14. A sub-assembly for forming part of the casing and mechanism of an electric keeper-releasing device, said sub-assembly comprising, in combination, a casing wall member made of solid dielectric material and having mounted thereon and exposed on one face thereof electro-magnetic means forming part of said mechanism and having mounted thereon but exposed on the other face thereof a plurality of connecting terminals that are in electrical connection with the winding of said electro-magnetic means, whereby, upon assembly of said sub-assembly to the remainder of the casing and mechanism, said electromagnetic means is positioned interiorly of the casing to coact with the remainder of said mechanism, and said connecting terminal means are exposed externally of the casing.

15. In construction of the character described, in combination, a casing having opposed wall members, one of which is separable from the other, each of said wall members carrying complementary bearing means which, when said wall members are assembled, form complete bearing means, a keeper having means receivable between said complementary bearing means, whereby said keeper is mounted for pivotal movement, a member that is to coact with said keeper and adapted upon pivoting movement to prevent or permit pivoting movement of said keeper in its said bearing means, said member having a bearing portion and said opposed wall members having additional complementary bearing means for reception of said bearing portion but so positioned that, when said opposed wall members are assembled with said bearing portion in said additional bearing means, said member is pivotally mounted in proper and cooperative relation to said keeper, and a pivotable armature adapted to control said member, said opposed wall members having portions for pivotally supporting and holding said armature but so positioned that, when said wall portions are assembled, said armature is properly and cooperatively related to said member, and means securing said separable wall member to the rest of said casing and thereby holding said keeper, said coacting member and said armature against disassembly.

16. A construction as claimed in claim 15 in which there is provided electromagnetic means for controlling said armature, said electromagnetic means being provided with supporting means therefor, and in which said opposed wall members have portions adapted to engage and hold said supporting means but so positioned that, upon assembly and securing together of said wall members, said electromagnetic means is properly and cooperatively related and held with respect to said armature.

17. In an electric keeper-release mechanism that has a movable keeper, an armature for permitting or preventing movement of the keeper, and electromagnetic means for controlling said armature, the combination which comprises a two-part casing therefor, one casing part having means for pivotally receiving and supporting said armature to pivot about a certain axis, and supporting means for said electromagnetic means, said two parts having coacting portions for receiving and holding said supporting means in such a position that the electromagnetic means supported thereby is, upon assembly of said parts, properly and cooperatively related to said armature to control the movements thereof about its said axis.

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