Feb. 9, 1954 A. R. DE VITO 2,668,730

REMOTE-CONTROL APPARATUS FOR DOOR CONTROL MECHANISMS

Filed Oct. 10, 1947 3 Sheets-Sheet 1

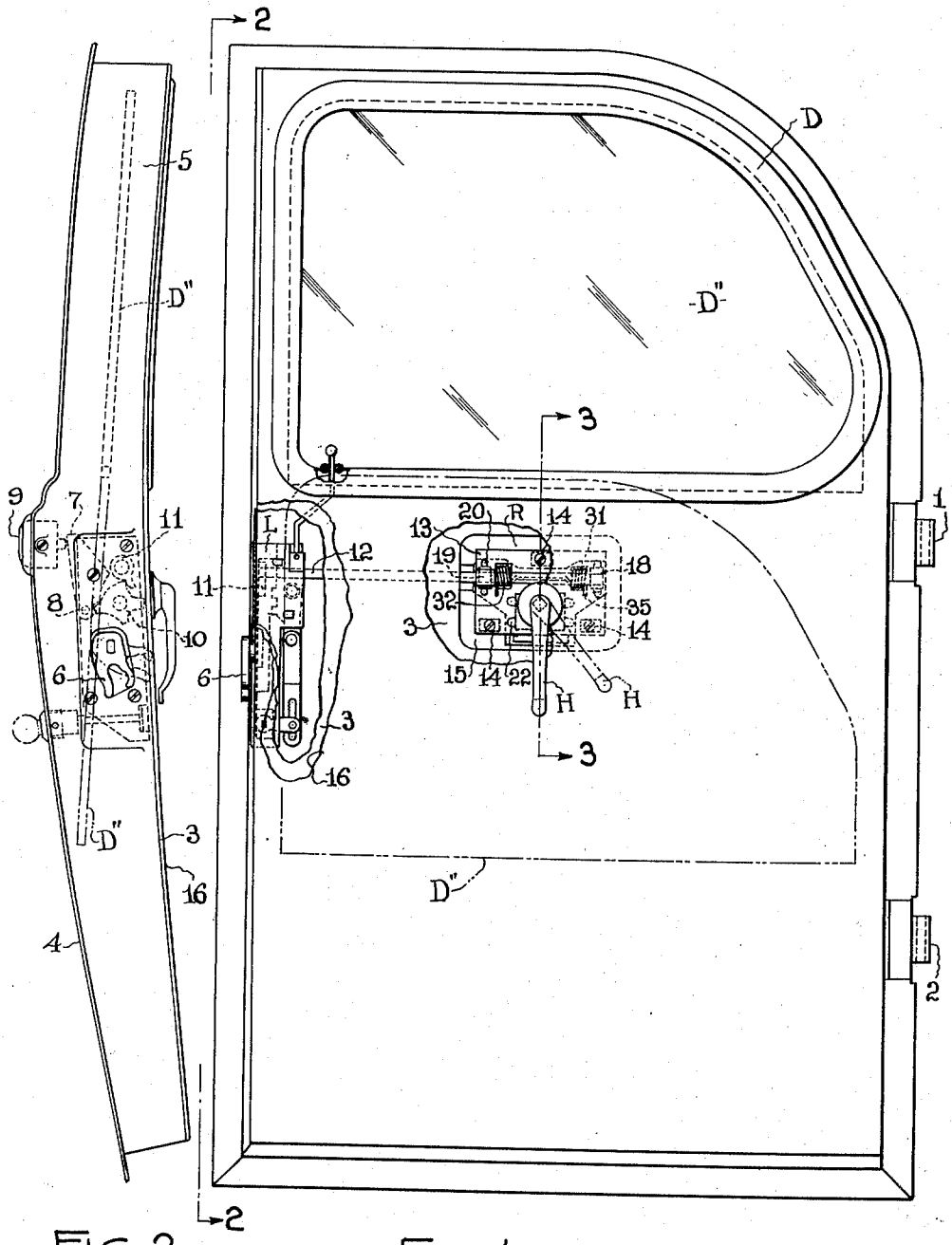


FIG. 2

FIG. 1

INVENTOR.
ANGELO R. DEVITO
BY
Brownell & Sessions
ATTORNEYS.

Feb. 9, 1954 A. R. DE VITO 2,668,730

REMOTE-CONTROL APPARATUS FOR DOOR CONTROL MECHANISMS

Filed Oct. 10, 1947 3 Sheets-Sheet 2

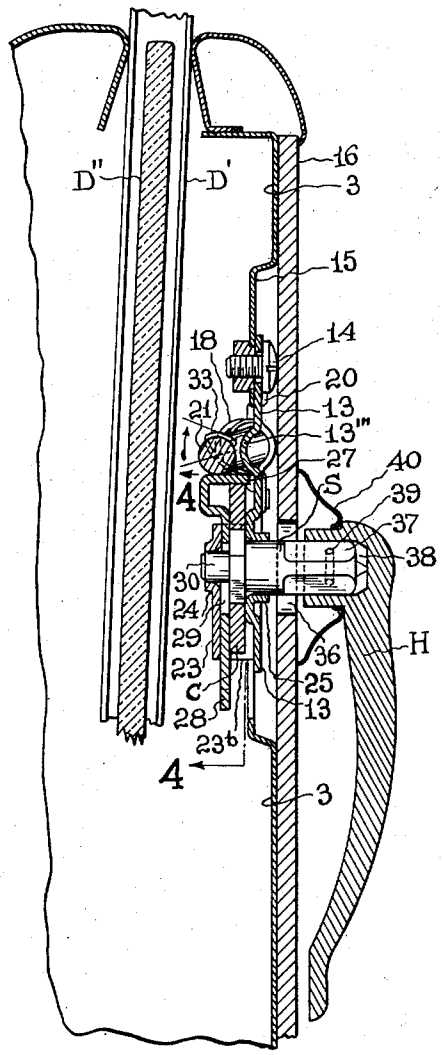


FIG. 3

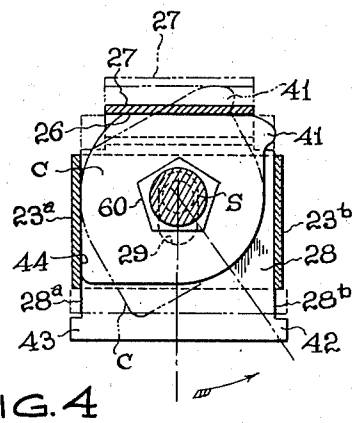


FIG. 4

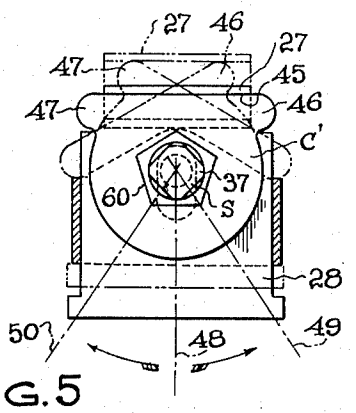


FIG. 5

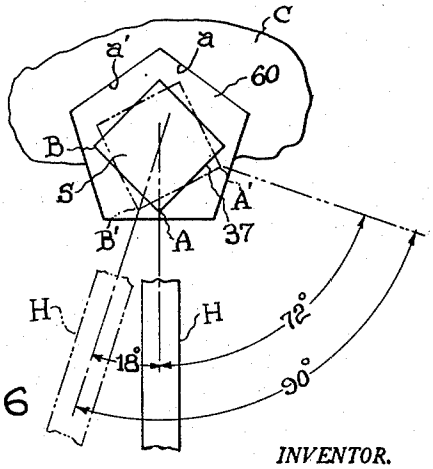


FIG. 6

INVENTOR.
ANGELO R. DEVITO
BY
Bosworth & Sessions
ATTORNEYS

Feb. 9, 1954 A. R. DE VITO 2,668,730

REMOTE-CONTROL APPARATUS FOR DOOR CONTROL MECHANISMS

Filed Oct. 10, 1947 3 Sheets-Sheet 3

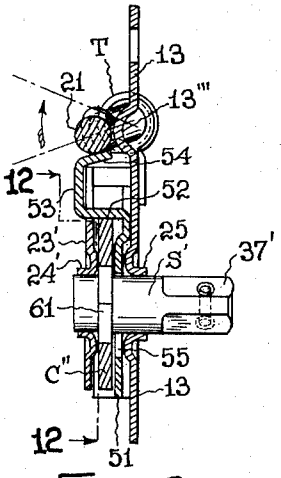


FIG. 8

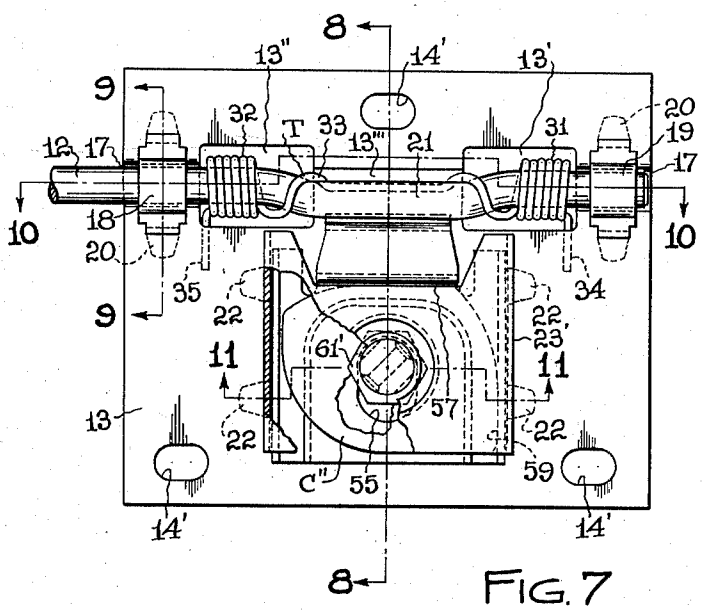


FIG. 7

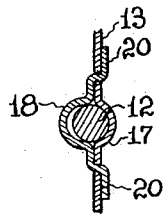


FIG. 9

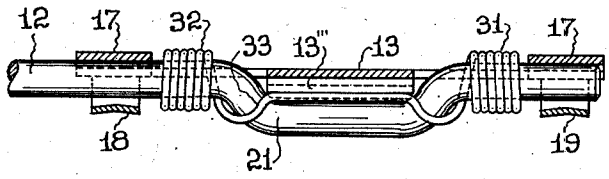


FIG. 10

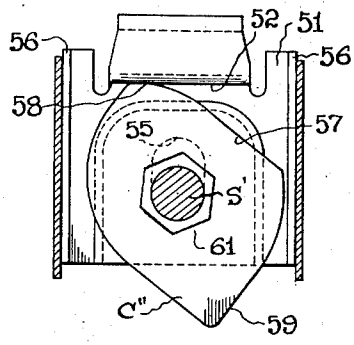


FIG. 12

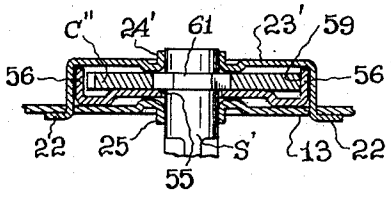


FIG. 11

INVENTOR.
ANGELO R. DEVITO
BY
Bosworth & Sessions
ATTORNEYS.

Patented Feb. 9, 1954

2,668,730

UNITED STATES PATENT OFFICE

2,668,730

REMOTE CONTROL APPARATUS FOR DOOR CONTROL MECHANISMS

Angelo R. de Vito, Cleveland Heights, Ohio, assignor, by mesne assignments, to Rudolph I. Schonitzer, Cleveland, Ohio

Application October 10, 1947, Serial No. 779,101

3 Claims. (Cl. 292—336.3)

1

This invention relates to door control apparatus and more particularly to an improved manually operable remote control mechanism for use in connection with vehicle door latches.

It is frequently desired, in automobile door installations or the like, to provide a "remote control" mechanism whereby the door latch may be released from a point on the inside of the door spaced a substantial distance from the latch mechanism proper. In the Rudolph I. Schonitzer United States Patent No. 2,094,413 there is disclosed a remote control mechanism for door latches wherein an elongated rockable member is employed to effect release of a door latch from inside the door. The present invention contemplates the employment of an elongated rockable member or remote control shaft of the general type disclosed in said Schonitzer patent together with means for effecting rocking or rotational movement thereof by movement of a handle or lever arm member in a plane generally parallel to the inner door panel.

Accordingly, it is an object of the present invention to provide an improved remote control mechanism for vehicle door latches or the like wherein a manually operable handle member, supported for movement generally parallel to the inner door panel, is employed.

Further objects of my invention include: the provision of a remote control mechanism, the components of which may be assembled in various positions relative to each other without change in their form whereby the same parts may be made up into units adapted to fulfill a wide range of different installation requirements; the provision of a remote control mechanism for door latches which converts movement of a handle member in a plane generally parallel to the inner door panel into rotational movement of a remote control shaft which extends generally parallel to said door panel; the provision of a remote control mechanism of the type described which automatically takes care of misalignment due to normal manufacturing variations in the door structure with which the apparatus is associated; the provision of a remote control mechanism which incorporates and includes means for returning all parts thereof to their neutral positions after actuation and also takes up backlash and prevents rattles; the provision of a remote control mechanism for vehicle door latches which permits the glass run channels to be disposed relatively close to the inner door panel without interference with the travel of the glass by the remote control mechanism; the provision

2

of means for permitting a handle member or the like to be selectively assembled in any one of a plurality of different angular positions relative to another element of the apparatus, thus accommodating different installation conditions or requirements; the provision of handle operated remote control mechanisms of the type described which may be installed on doors with the axis of rotation of the handle disposed either above or below the remote control shaft; the provision of a compact, rugged, durable, and effective remote control mechanism for door latches which is particularly well adapted to economical manufacture, which may readily be installed in various designs of door structures, and which will give trouble-free service for long periods of time; and the provision of a remote control mechanism of the type described which, although especially well adapted for use with door latch mechanisms of the general type shown in said Rudolph I. Schonitzer Patent No. 2,094,413, is also adapted for use with other types of door latch mechanisms.

The above and other objects of my invention will appear from the following description of several embodiments thereof, reference being had to the accompanying drawings in which:

Figure 1 is a side elevation of a left-hand vehicle door, hinged at its forward edge, incorporating my improved remote control mechanism, the view being taken from the inside of the door, parts of the inner door panel being broken away more clearly to illustrate the door latch and remote control units, and the glass being shown in raised or closed position.

Figure 2 is a rear edge view of the door shown in Figure 1, taken substantially on line 2—2 of Figure 1.

Figure 3 is an enlarged vertical cross-sectional view, taken substantially on line 3—3 of Figure 1 but the glass being shown in lowered or open position, illustrating one embodiment of my remote control mechanism.

Figure 4 is a detached fragmentary vertical cross-sectional view, taken substantially on line 4—4 of Figure 3, illustrating the cam and slide mechanism.

Figure 5 is a view generally similar to Figure 4 but illustrating a modified form of cam and slide whereby movement of the operating handle in either direction from its door latched or neutral position will effect release of the latch mechanism.

Figure 6 is a diagrammatic view to illustrate my improved cam and handle mounting arrange-

ment whereby a plurality of different neutral handle positions may be obtained.

Figure 7 is a detached side elevational view, taken from the outside of the door in which the device is installed, illustrating a modified form of my remote control mechanism, the unit shown being the opposite hand from that shown in Figures 1 to 5 inclusive.

Figure 8 is a vertical cross-sectional view taken substantially on line 8—8 of Figure 7.

Figure 9 is a detached fragmentary vertical cross-sectional view, taken on line 9—9 of Figure 7, illustrating one of the supporting bearings for the remote control shaft.

Figure 10 is a horizontal cross-sectional view taken substantially on line 10—10 of Figure 7.

Figure 11 is a fragmentary horizontal cross-sectional view taken substantially on line 11—11 of Figure 7.

Figure 12 is a detached illustrative view taken substantially on line 12—12 of Figure 8, the cam and slide being illustrated in their door unlatched positions.

Referring particularly to Figures 1 and 2, the door D may be considered to be the left-hand front door of an automobile, hinges 1 and 2 being provided at its forward edge whereby the door is suitably supported on the vehicle body (not shown). The inner door panel is indicated at 3, the outer door panel at 4, and the rear or free edge wall of the door structure at 5. In order releasably to retain the door D in closed position a latch mechanism, generally indicated at L, is disposed at the rear or free edge 5. As illustrated this latch mechanism is of the type shown, described and claimed in the copending United States patent application of Edwin L. Allen, Serial No. 746,521, filed May 7, 1947. As the details of the latch mechanism per se form no part of the present invention it will be sufficient to point out here that the mechanism includes a latch member 6 supported for movement between door latched and door unlatched positions adjacent and generally parallel to the free edge wall 5 of the door. This latch member 6 coacts with a suitable keeper pin or the like carried by the door frame (not shown) whereby the door may be held in closed and latched position.

The latch mechanism L also includes a detent control arm 7 pivotally supported on the latch frame at 8. As shown in Figure 2, the latch member 6 is in door latched position and the latch mechanism is such that when the arm 7 is moved clockwise from the position shown in Figure 2 the latch member 6 will be released, permitting movement thereof in counterclockwise direction into door unlatched position. Movement of the arm 7 to release the latch is effected by pressure on the outside push button unit 9. Also included in the latch mechanism L is a detent member 10 adapted releasably to hold the latch member 6 in door latched position. This detent 10 is moved from latch holding to latch released position by the above mentioned clockwise movement of the operating arm 7. A movable detent actuating member for effecting release of the latch, comprising a detent control pawl 11, is also supported in the housing of the latch mechanism L for rotational movement and, as illustrated, is positioned to directly engage detent 10 whereby rotation of the movable actuating member or pawl 11 in clockwise direction, as seen in Figure 2, will effect movement of detent 10 to release the latch member 6 and permit the door to be opened. The arm 7 and pawl 11 are independently operable to effect movement of detent 10 to release latch member 6.

The remote control shaft 12 is operatively associated with the pawl 11 in any suitable manner whereby rotational movement of shaft 12 causes corresponding movement of pawl 11. As is best seen in Figure 1, the shaft 12 is disposed between the side walls 3 and 4 of door D and extends away from the free edge wall 5 toward the center of the door.

The length of shaft 12 determines the distance away from the free edge 5 of the door at which the remote control unit, generally indicated at R, is located and it will be understood that different door and body designs may require different positioning of the remote control mechanism relative to the latch mechanism proper.

As several embodiments of my improved remote control mechanism are illustrated in the accompanying drawings and as all of these embodiments have a number of elements in common while certain other elements, particularly the cam and slide, differ in the various embodiments, the same reference characters have been employed to indicate substantially identical elements in all the views. Accordingly reference is made to all of the figures for a full understanding of the form and arrangement of the parts which are common to all embodiments of my invention.

Referring now particularly to Figures 1 and 3 it will be seen that the remote control mechanism R includes a supporting member in the form of a plate 13 secured to the inner door panel 3 as by screws 14. Panel 3 is preferably recessed as indicated at 15 in Figure 3 to accommodate the remote control mechanism and permit the inside trim 16 to be smoothly applied to the inner face of the door. Spaced shaft supporting grooves or bearing portions 17 are formed in the supporting plate 13 and bearing caps 18 and 19 (best seen in Figure 7) are secured thereto by tangs 20. The particular form of the bearing caps 18 and 19 will be more fully described later but it may be noted here that they, together with the bearing grooves 17 provide spaced bearings for the remote control shaft 12. Spaced from the latch L and between the bearing caps 18 and 19 the shaft 12 is provided with an offset or crank section 21 which, as is seen in Figure 3, extends away from the supporting plate 13. As illustrated the offset section 21 is formed integrally with shaft 12 but it will be understood that it might comprise a separate piece secured to shaft 12.

Holes 13' and 13'' are formed in plate 13 to accommodate the remote control shaft spring, generally indicated at T, and plate 13 is formed with a channel portion 13''' extending between the holes 13' and 13''. The features just described are best seen in Figures 7, 8 and 10 and it will be observed that channel portion 13''' projects from the plane of plate 13 in the opposite direction from bearing portions 17 and extends into the offset 21 of shaft 12. The functions of channel 13''' are to stiffen the supporting plate 13 and also to provide stop means cooperating with the offset 21 for preventing undesirable longitudinal movement of shaft 12 relative to plate 13.

Secured to the supporting plate 13 by tangs 22 is a cam housing and slide member supporting and guiding means 23. As clearly seen in Figure 3, this housing 23 is apertured to form an inner bearing 24 for the actuating or cam

shaft generally indicated at S. Supporting plate 13 is also apertured at 25 to form an outer bearing for shaft S which, as shown, extends transversely of and substantially at right angles to the axis of rotation of remote control shaft 12. It will be noted from Figures 3 and 4 that the housing 23 has side walls 23a and 23b extending away from plate 13, that its outer face is spaced from and generally parallel to plate 13, and that it is open at its top and bottom.

Supported on shaft S for rotation therewith, in a manner to be more fully described later, is the cam member generally indicated at C. This cam has a flattened upper face 26 which, when the form of my remote control mechanism illustrated in Figures 3 and 4 is in its door latched or neutral position, is disposed substantially horizontally and in contact with the top flange 27 of the operating member or slide 28. This slide 28 has a vertically extending elongated slot 29 formed therein and is positioned in the housing 23 with the end portion 30 of the actuating or cam shaft S extending therethrough, thus permitting limited guided movement of the slide member 28 in the housing 23. As is best seen in Figures 3 and 4, the cam C is operatively associated with the slide 28 which is a generally flat plate member the side edges 28a and 28b of which have a free sliding fit within the side walls 23a and 23b of the housing 23 whereby the slide 28 is guided for movement in a plane substantially normal to the longitudinal axis of the remote control shaft 12. The upper end of slide 28 is formed in generally C-shaped cross section as seen in Figure 3, the top flange 27 thereof having its upper surface in operative engagement with the offset portion 21 of the shaft 12.

In order to urge the remote control shaft 12 and handle H toward neutral or door latched position as shown in Figures 1 and 3, I provide a double ended torsion spring T having spaced coil portions 31 and 32 surrounding shaft 12 and connected by an intermediate section 33 which is formed to fit around and engage the crank section 21 of shaft 12 (see Figures 1, 7 and 10). The free end portions 34 and 35 of the coils 31 and 32 extend downwardly in engagement with the inner face of supporting plate 13 and, as the spring T is installed in a pre-loaded condition, it at all times tends to rotate the shaft 12 and the offset crank portion 21 thereof in counterclockwise direction (Figure 3) and thus to return the handle H to its normal door latched or neutral position after latch releasing movement. Spring T also serves to resiliently urge shaft 12 into the bearing grooves 17 in plate 13.

The cam shaft S extends through a suitable opening 36 in the inner trim 16 and has a squared inner end portion 37. The operating handle H is correspondingly recessed at 38 to fit the squared end 37 of shaft S and may be secured thereon by any suitable means such as a pin 39. Carried by the hub of the handle H is a bezel 40 which extends to the inner trim 16 of the door D.

The operation of the above described embodiment of my remote control mechanism will now be described. As seen in Figures 1 and 2, the latch mechanism L is in door latched position and accordingly my remote control mechanism als oappears in its door latched, non-releasing or neutral position. As illustrated, the handle H extends substantially vertically downwardly from the cam shaft S and it will be noted from Figures 3 and 4 that the offset portion 21 of shaft 12 is in its lower position and is held

against the upper surface of flange 27 to slide 28 by the torsion spring T. So also, the under surface of flange 27 of slide 28 is held down against the flat face 26 of cam C. The engagement of the flat face 26 of cam C with the flat surface of flange 27 of the slide member 28 establishes a stable condition in which further downward movement of slide 28, or counterclockwise rotation (Figure 3) of shaft 12, under the influence of spring T is prevented. As will be later more fully explained, a positive stop against movement of cam C, slide 28, and shaft 12 beyond the positions shown in Figures 1 to 4 is provided by the edge face 44 of cam C. The connection between the outer end of shaft 12 and the latch mechanism L is such that when the remote control unit R is in this non-releasing or neutral position the latch mechanism L will, unless actuated by the outside push button 9, remain latched with the detent 10 holding the latch member 6 in door latched position.

Now, if it is desired to open the vehicle door from the inside, the operator moves the handle H about its axis of rotation (the longitudinal center line of cam shaft S) from the full line position into the position shown in dot and dash lines in Figure 1. This movement causes the cam C to move from the full line position shown in Figure 4 into the dot and dash line position shown therein and the rounded end portion 41 of cam C will ride against the under surface of flange 27 of slide 28 thus lifting the slide 28 into the dot and dash line position shown in Figure 4 and causing the crank section 21 and shaft 12 to be rotated in clockwise direction as seen in Figure 3 through the angle indicated by the arrow. This movement is against the spring T and causes corresponding movement of the pawl 11 to move detent 10 and release the latch member 6, permitting opening of the door D. As soon as the operator releases the handle H it is returned from the phantom line position of Figure 1 into its normal or neutral position shown in full lines in Figure 1 by the spring T, this return movement causing no action of latch L and being permitted by the form of the pawl 11 and detent 10. Also, as the pawl 11 and arm 7 are independently operable, either the outside push button 9 or the remote control handle H may be moved between their door latched and latch released positions without causing any movement of the other.

Upward or latch releasing movement of the slide 28 is limited by lugs 42 and 43 which, as is seen in phantom lines in Figure 4, engage the side walls 23b and 23a respectively of the housing 23 when the handle H and cam C are rotated into their door unlatched positions. Movement of the handle H in clockwise direction (Figure 1) beyond its door latched or neutral position is prevented, in the embodiment of my invention shown in Figures 1 to 4 inclusive, by means of the edge face section 44 of cam C which, when the handle H is in door latched position, engages the inner face of the side wall 23a (Figure 4) of the housing 23 thus preventing further movement of the cam C, cam shaft S, or handle H in clockwise direction.

In Figure 5, which is generally similar to Figure 4, I have illustrated a modified form of cam C' having a flat face 45 and opposed similar rounded end portions 46 and 47. Each of these rounded end portions is generally similar to the portion 41 of cam C and performs substantially the same function. However, as the lower por-

tion of cam C' is formed on a radius about the cam shaft S, the handle H, when the cam C' is used, may be moved in either direction from its door unlatched or neutral position (indicated in Figure 5 by the center line 48). Thus when the handle H moves from the position indicated by center line 48 into position indicated by center line 49 (Figure 5) the rounded end portion 46 of cam C' engages the underside of flange 27 and lifts the slide member 28 causing the latch to be released as previously described. In like manner, if the handle H is moved in clockwise direction from the neutral position indicated by center line 48 into the position indicated by center line 50 the rounded end portion 47 of cam C' engages flange 27 and lifts the slide 28, with corresponding movement of the shaft 12, to cause release of the latch mechanism L.

It will be noted that in the embodiments of my invention illustrated in Figures 1 to 5 inclusive the cams C or C' engage one side of the flange 27 of slide 28 while the offset section 21 of remote control shaft 12 is engaged by the opposite side of flange 27. With this arrangement, if it is desired to increase or decrease the distance between the longitudinal center line of the remote control shaft 12 and the longitudinal center line of the transversely extending cam shaft S it is necessary to change the form of the cam C as well as that of the slide member 28. In Figures 7 to 12 inclusive I have illustrated a modified form of my invention whereby the same cam member may be employed even though the spacing between the shaft 12 and shaft S is varied to satisfy the requirements of the particular installation involved. In this embodiment of my invention supporting plate 13 is substantially the same as that shown in the previously described embodiments but the slide member 51, which corresponds in function to slide 28, is disposed between the cam C'' and the supporting plate 13. At its upper end the slide 51 has an outwardly extending cam engaging portion 52 (see Figure 8), an upwardly extending portion 53, and an inwardly bent upwardly inclined crank engaging portion 54. By inclining portion 54 relative to the path of movement of slide 51 the downward (Figure 8) pressure of crank 21 on portion 54 will tend to urge the top part of slide 51 toward plate 13 and the bottom part away from plate 13, thus avoiding binding or digging in of the lower edge of slide 51 against plate 13. Slide 51 is provided with an elongated slot 55 which fits over the cam shaft S' and is provided with side flanges 56 (see Figure 11) which have sliding engagement with the sides of the cam housing 23'. Vertical movement of slide 51 is limited by engagement of the ends of slot 55 with shaft S'.

Cam shaft S' is supported in a bearing 25 in the supporting plate 13 and in a bearing 24' in the housing 23'. Cam C'' is secured to and rotatable with the shaft S', as will be more fully described later, and shaft S' has a squared handle carrying end portion 37' on which an operating handle may be mounted as previously described. As may be seen in Figures 7 and 12 the contour of cam C'' includes a flat portion 57 and an adjoining curved portion 58. When the parts are in the door latched or neutral position as seen in Figure 7 the portion 52 of slide 51 is in engagement with the flat portion 57 of cam C''. Further movement of the cam C'' in counterclockwise direction (as seen in Figure 7) beyond neutral position is prevented

by engagement of the edge portion 59 of cam C'' with the side flange 56 of slide 51. Movement of the handle and shaft S' in clockwise (Figure 7) or latch releasing direction is permitted however and will rotate the cam C'' into its door unlatched position as seen in Figure 12. This movement will lift the slide 51 from the position shown in Figure 7 to that shown in Figure 12 with corresponding rotation of the remote control shaft 12 which rotation will effect release of the latch mechanism L and permit opening of the door. As seen in Figure 12 the lower end of slot 55 engages shaft S' to limit upward movement of slide 51 and clockwise movement of cam C''. By forming the cam C'' with the curved section 58 adjacent the flat portion 57 a somewhat greater angular movement of the handle H is required to effect the required degree of rotation of remote control shaft 12 than is required with the cam forms shown in Figures 4 and 5. Further, the point of contact of cam C'' and portion 52 of slide 51 always remains sufficiently far away from a vertical plane through the center line of shaft S' to insure that spring T will always return handle H to its neutral position after actuation.

With the cam and slide arrangement illustrated in Figures 7 to 12 inclusive the shaft S' may be moved toward or away from the shaft 12 by varying the location of its supporting bearings in the plate 13 and housing 23'. If such changes are made in the spacing of the cam shaft bearings from the shaft 12 no change in the size or form of the cam C'' will be required and it will merely be necessary to make the upwardly extending portion 53 of slide 51 longer or shorter so that the crank engaging portion 54 will properly engage the crank section 21 of shaft 12. Thus the embodiment of my invention illustrated in Figures 7 to 12 inclusive may readily be adapted, with a minimum of manufacturing changes, to the production of remote control units suitable for various installation conditions.

Figures 9 and 10 clearly illustrate the supporting bearings for the shaft 12. As previously noted the bearings for the shaft 12 are formed by groove portions 17 in the supporting plate 13 and the bearing caps 18 and 19 which are secured to the plate 13 by tangs 20. The grooves 17 are contoured to fit the shaft 12 but the bearing caps 18 and 19 are extended so that the bearing apertures, instead of being round in cross section are elongated as is clearly seen in Figure 9. It will also be noted from Figure 10 that the bearing grooves in the caps 18 and 19 are flared outwardly from a center portion of minimum diameter to end portions of maximum diameter. With this bearing support arrangement the shaft 12 is held against any substantial vertical movement or play but may have a certain degree of horizontal displacement relative to plate 13. This arrangement is desirable in order to take care of horizontal misalignment due to manufacturing inaccuracies in the inner door panel 3 which would otherwise result in binding or excessive friction of the shaft 12 in its bearings, it being understood that shaft 12 may be mounted in proper vertical alignment with the pawl 11 by the oversize slots 14' (see Figures 3 and 7) in the plate 13 through which mounting screws 14 extend.

As is best seen in Figure 3, my remote control mechanism is relatively thin in its over-all transverse cross section and when mounted in a door extends only a small distance from the inner

door panel 3 into the space between panels 3 and 4. This permits the glass run channels or guides D'' and the glass D''' to be disposed relatively close to the inner panel 3 without interference from the remote control mechanism.

Another feature of my remote control mechanism is its adaptability to assembly variations, without change in the size or form of the component parts, whereby remote control units may be readily made up as right-hand or left-hand units, the rotation of the operating handle may be clockwise, counterclockwise, or both, the remote control shaft may extend forwardly or rearwardly from the handle member, the cam shaft may be disposed either above or below the remote control shaft, etc. If, for example, it should be desired to produce a device like that of Figures 1, 3 and 4 except that the handle H have movement toward instead of away from the free edge 5 of door D it is only necessary to turn over the cam C when assembling it on shaft S so that projection 41 extends toward edge wall 23ª of housing 23 instead of toward edge wall 23ᵇ.

When a handle, such as handle H described above, is employed for operating a vehicle door latch remote control mechanism it should preferably be so disposed adjacent the inner door panels as not to interfere with the comfort of the vehicle passengers, to be readily accessible, and to have the most desirable path of movement from the standpoint of safety and operator convenience. To fulfill these requirements on different body styles and designs it is desirable that the operating handle H of the remote control mechanism be arranged so that it can readily be assembled to have the desired neutral angular position and direction of movement for the particular installation with which the mechanism is used. I accomplish this result by providing a driving or cam carrying section of regular polygonal cross section and a handle carrying section, also of regular polygonal cross section, on the cam shaft of my remote control mechanism, the cam being apertured correspondingly to the driving section and the handle being apertured correspondingly to the handle carrying section, the polygonal driving section having a number of sides differing from the number of sides of the polygonal handle carrying section, and a corner of the polygonal driving section being in radial alignment with a corner of the polygonal handle carrying section.

In the embodiments of my invention shown in Figures 1 to 6 the driving or cam carrying section 60 of the cam shaft S is of pentagonal cross section and, as previously noted, the handle carrying section 37 is of square cross section. As is seen in Figure 5 the top corner of the square section 37 is in radial alignment with the top corner of the pentagonal section 60. The cam C is formed with a pentagonal aperture and may have a press fit on the pentagonal section 60 or be welded, brazed or otherwise rigidly secured thereto. It will be understood that in assembling the device the cam C (or C' as the case may be) may be assembled with the flat face 26 disposed in any one of 5 different positions relative to the shaft S. So also, the handle H may be disposed on the square section 37 of the shaft S in any one of four different positions relative to the shaft S. By arranging the polygonal sections as described and by having the number of sides of one polygonal section differ from one from the number of sides of the other polygonal section I am able to obtain a series of selective positions of the handle H, relative to the cam C, equal in number to the product of the number of sides of one polygonal section and the number of sides of the other polygonal section. Thus, in the embodiment just described the number of positions of the handle H relative to the cam C is the product of 5 and 4, or 20 possible different positions.

It will be seen from the above explanation that, by assemblying the cam C on the driving section 60 in the proper position and by selecting the proper position of the handle H on the handle carrying section 37, the handle H may be arranged in any one of 20 different angular positions, spaced 18 degrees apart, relative to cam C. This permits my improved remote control mechanism readily to be adapted to a wide range of installation conditions regardless of whether it is desired to have the handle, when in neutral position, extend upwardly, downwardly, horizontally, or in any one of a large number of intermediate directions.

In Figure 6 the full lines illustrate diagrammatically one neutral position of the handle H and cam C on the shaft S. In dot and dash lines I have indicated how the parts may be assembled so that the neutral position of handle H is shifted 18° in counterclockwise direction without changing the neutral position of the cam C. This change is accomplished by turning the shaft S 72° (one step of the pentagonal section 60) in counterclockwise direction relative to cam C into the dot and dash line position of Figure 6 and then inserting section 60 into the aperture in cam C. In so changing the assembled relation of cam C and shaft S the cam C is held in its original position but the side *a* of the pentagon 60 is moved to the position indicated at *a'* and the other sides of the pentagon each move in similar manner one 72° step in counterclockwise direction. During this 72° counterclockwise movement of the shaft S the bottom corner A of the square section 37 will, of course, also move through 72° in counterclockwise direction to the position indicated at A' and the corner B will move to the position indicated at B' in dot and dash lines. From the above explanation it will be seen that if the handle H is now positioned on the square section 37 of shaft S as indicated in dot and dash lines in Figure 6 so that it extends on a radius passing through the new position B' of corner B of square section 37, it will have a neutral or door latched position which is 18° removed in clockwise direction from the full line position shown in Figure 6. By similar manipulation of the position of shaft S and handle H relative to the cam C as the parts are assembled together the handle H may be located in any one of 20 different equally spaced neutral positions while cam C is maintained in the same neutral position.

In the embodiment shown in Figures 7 to 12 inclusive the polygonal driving section 61 of shaft S' is hexagonal in form while the shaft carrying section 37' remains square in cross section. With this arrangement the number of possible positions of the handle H relative to cam C will equal the product of the number of sides of the driving section 61 and the number of sides of the handle section 37' divided by two or

$$\frac{6\times 4}{2}=12$$

Thus, with this selection of polygonal sections the handle may be set in any one of 12 different radial positions while the cam C''' remains in its

normal door latched or neutral position as seen in Figure 7. Accordingly, where the maximum number of closely spaced handle positions is desired an arrangement of the type shown in Figures 1 to 6, employing polygonal driving and handle sections having numbers of sides differing by one, is preferable while if a lesser number of positions of the parts is satisfactory an arrangement of the type shown in Figures 7 to 12 may be employed. It will also be understood that although the herein described means for varying the relative positions of two members carried on a shaft or the like is illustrated as applied to my remote control mechanism it may be used in many other mechanical assemblies where such variation is desired.

Although I have described the illustrated embodiments of my invention in considerable detail it will be understood that variations may be made in the form, proportions, and arrangement of the parts which make up my improved remote control mechanism. For example, although the axis of cam shaft S is illustrated as extending substantially at right angles to the axis of remote control shaft 12 this angular relation could be varied to arrange shafts S and 12 in other non-parallel relations as required to meet different conditions. Also, the remote control shaft 12, which is shown herein as operatively connected to a pawl member 11 could be associated with any suitable element of a latch mechanism so long as the rotational movement of shaft 12 is effective to release the latch and permit opening of the door. I do not therefore wish to be limited to the particular embodiments herein shown and described but claim as my invention all forms thereof coming within the scope of the appended claims.

I claim:

1. Remote control mechanism for a door latch having a movable member for effecting release of said latch from door latched position including, a remote control shaft adapted to be connected to said movable member, said remote control shaft having an offset section, a supporting member adapted to be secured to the door with which the mechanism is associated, spaced remote control shaft bearings carried by said supporting member, said remote control shaft being carried by said bearings with said offset section disposed therebetween, spring means extending between said supporting member and said offset section and tending to rotate said remote control shaft in one direction, said bearings being elongated in a direction away from said supporting member and adapted to prevent displacement of the axis of rotation of said remote control shaft in a plane parallel to said supporting member while permitting limited displacement of said axis in a plane transverse to said supporting member, a slide member, means carried by said supporting member for guiding said slide member for lineal movement substantially normal to the axis of rotation of said remote control shaft, said slide member having a flange portion the outer surface of which is in engagement with said offset section, a cam shaft rotatably supported by said supporting member and having its axis of rotation extending in non-parallel relation to said axis of rotation of said remote control shaft, a cam carried by said cam shaft and rotatable therewith, said cam having operating engagement with the inner surface of said flange portion of said slide member whereby rotation of said cam in one direction moves said slide member and said offset section of said remote control shaft with resulting rotation thereof, said cam having a flat portion and said inner surface of said flange on said slide member having a corresponding flat portion, said flat portions being positioned to be in engagement when said remote control shaft is in neutral or non-releasing position relative to said latch, said spring means, acting on said cam through said offset section and said slide member, tending to hold said cam in said non-releasing position and to return it thereto when moved toward releasing position, and manually operable handle means for rotating said cam shaft.

2. Remote control mechanism for a door latch comprising, a remote control shaft adapted to be operatively connected at one end to the door latch whereby rotation of said remote control shaft will effect releasing of the door latch, said remote control shaft having an offset section spaced from said one end thereof, a supporting member adapted to be secured to the door with which the mechanism is associated, spaced remote control shaft bearings carried by said supporting member, said remote control shaft being supported in said bearings with said offset section disposed therebetween, a spring member extending between said supporting member and one side of said offset section and tending to rotate said remote control shaft in one direction, a slide member, a cam housing member carried by said supporting member and having an outer face portion and spaced parallel side walls, said side walls being disposed to guide said slide member for lineal movement substantially normal to the axis of rotation of said remote control shaft, said slide member having a shaft engaging surface disposed in contact with the opposite side of said offset section of said remote control shaft from said spring member and said spring holding said offset section in contact with said shaft engaging surface, a cam shaft rotatably supported by said supporting member and said cam housing member and having its axis of rotation extending in non-parallel relation to said axis of rotation of said remote control shaft, a cam carried by said cam shaft and rotatable therewith between said housing and said supporting member, said cam having operative engagement with another surface on said slide member, said other surface being spaced toward said cam shaft from and extending substantially parallel to said first named surface on said slide member, said cam having a contour whereby rotation of said cam shaft in one direction moves said slide member toward said remote control shaft and said offset section in a direction to rotate said remote control shaft against the action of said spring member, and manually operable means for rotating said cam shaft.

3. Remote control mechanism for a door latch comprising, a remote control shaft adapted to be operatively connected at one end to the door latch whereby rotation of said remote control shaft will effect releasing of the door latch, said remote control shaft having an offset section spaced from said one end thereof, a supporting member adapted to be secured to the door with which the mechanism is associated, spaced remote control shaft bearings carried by said supporting member, said remote control shaft being supported in said bearings with said offset section disposed therebetween, said bearings being enlongated in a direction away from said supporting member and adapted to prevent displacement of the axis of rotation of said remote control shaft in a plane parallel to said support-

ing member while permitting limited displacement of said axis in a plane transverse to said supporting member, a spring member extending between said supporting member and one side of said offset section and tending to rotate said remote control shaft in one direction, a slide member, a cam housing member carried by said supporting member and having an outer face portion and spaced parallel side walls, said side walls being disposed to guide said slide member for lineal movement substantially normal to the axis of rotation of said remote control shaft, said slide member having a shaft engaging surface disposed in contact with the opposite side of said offset section of said remote control shaft from said spring member and said spring holding said offset section in contact with said shaft engaging surface, a cam shaft rotatably supported by said supporting member and said cam housing member and having its axis of rotation extending in non-parallel relation to said axis of rotation of said remote control shaft, a cam carried by said cam shaft and rotatable therewith between said housing and said supporting member, said cam having operative engagement with another surface on said slide member, said other surface being spaced toward said cam shaft

from and extending substantially parallel to said first named surface on said slide member, said cam having a contour whereby rotation of said cam shaft in one direction moves said slide member toward said remote control shaft and said offset section in a direction to rotate said remote control shaft against the action of said spring member, and manually operable means for rotating said cam shaft.

ANGELO R. DE VITO.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
265,474	Voll	Oct. 3, 1882
328,875	Budd	Oct. 20, 1885
1,056,333	Hill	Mar. 18, 1913
1,211,585	Hooper	Jan. 9, 1917
1,253,545	Tompkins et al.	Jan. 15, 1918
1,638,198	Heintz	Aug. 9, 1927
1,638,231	Archer et al.	Aug. 9, 1927
1,928,729	Logie	Oct. 3, 1933
1,955,434	Moore	Apr. 17, 1934
2,045,320	Wiley	June 23, 1936
2,094,413	Schonitzer	Sept. 28, 1937
2,140,842	Madsen	Dec. 20, 1938