

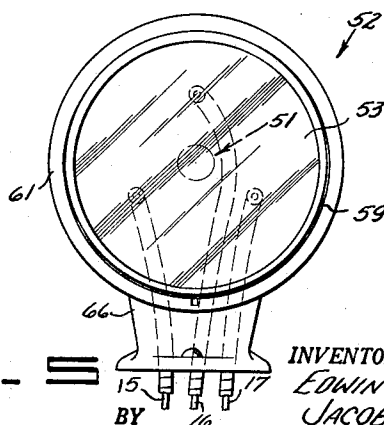
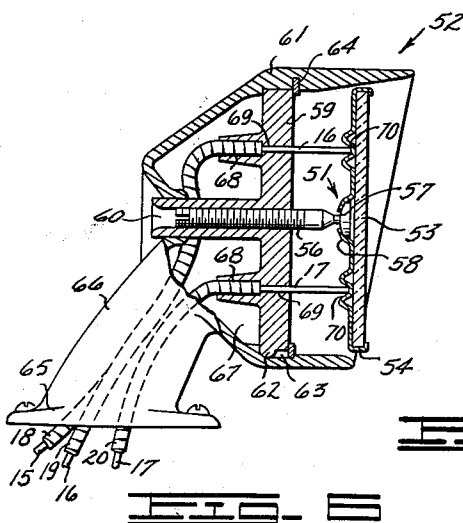
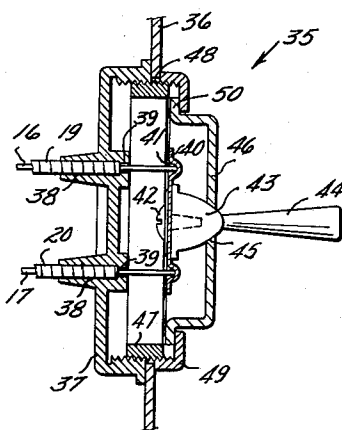
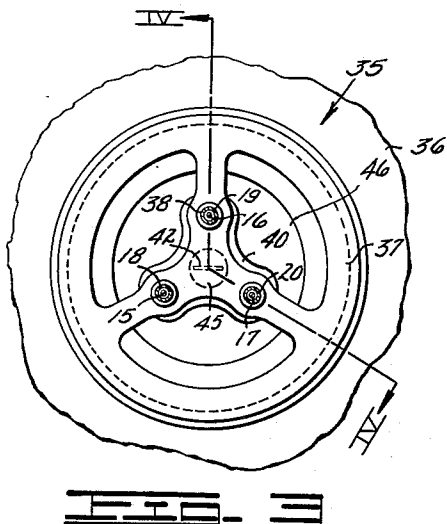
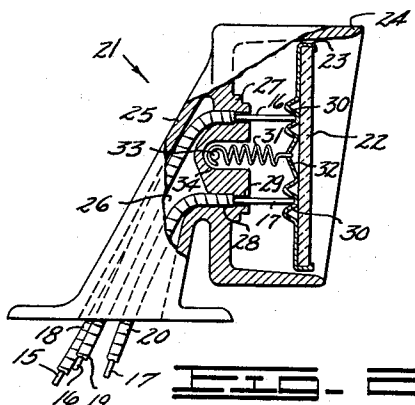
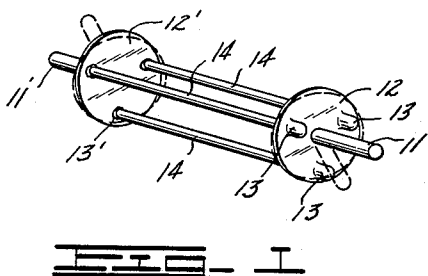
May 18, 1965

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3,183,736

REMOTE CONTROL FOR REARVIEW MIRROR

Filed April 23, 1962



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3,183,736

REMOTE CONTROL FOR REARVIEW MIRROR
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Filed Apr. 23, 1962, Ser. No. 189,352

13 Claims. (Cl. 74—501)

The present invention is directed to a compression type remote control actuation system for rearview mirrors and similar equipment where a universally mounted control element provides a mimic control over the accessory element. More particularly, the present invention provides an actuator structure and an accessory structure, each related by interacting intermediate Bowden wire type controls wherein the core elements are maintained under a net compression during all of the actuation.

Bowden wire type structures, wherein a sheathed core piece is slidably retained in a concentric sheath are well known. The core pieces move lineally so that motion imparted at one end is extended to the other end in an equal increment. These structures provide means for resiliently and frequently tortuously threading the control conduit through panels and around obstructions so that motion imparted to the core at one end provides corresponding movement in the other end which acts on the remote device to be controlled. As applied to automotive accessories, such as spotlights and rearview mirrors, such devices, under both tension and compression, are known wherein the accessory is desired to be universally movable when the accessory is located remotely from the actuator. The degree or amount of universal movement is limited by the amount of movement required in the particular accessory. Such accessory structures, for example, are well appreciated by reference to my U.S. Letters Patent 2,931,245. The present invention, a continuation-in-part of my co-pending application, Serial Number 777,887, filed on December 3, 1958, now U.S. Letters Patent 3,030,821, is directed to a simplified compression type remote control arrangement wherein actuation is accomplished under a system providing a net compression in the Bowden type wire core elements. The structure of the actuator is greatly simplified and modifications of the structure will be seen as applicable to plural wire systems utilized in a wide variety of use settings.

At least as early as 1958 it became apparent that any remote control system utilizing Bowden wire structures must employ a continuous stressing of the elongate members intermediate the actuator or control element and the accessory to be controlled. The function of this net stressing considered at rest is to assure elimination of vibrational effect tending to displace a selected setting and to absorb lost motion involved in prior art structures in the alternate shifting, as between elongate elements, from tension to compression.

Accordingly, the present invention is directed to providing a compression type actuator and an accessory adapted to utilize the compression system. It has been found that by utilizing compression in the elongate members, in contrast to the more usually utilized tension, that considerable advantages in economy and construction, as well as in installation are realizable since the Bowden wire elements require no separate clinching or securing to either the actuator or accessory served. Additionally, adjustments at one or both ends of the structure can be accomplished upon assembly so as to render length factors in the individual Bowden wire core pieces less critical.

Accordingly, great economies in the remote control units can be realized and without sacrifice of precision adjustment. As will be appreciated, the application of the

compression in the Bowden wire elements may be rigidly applied or may be resiliently applied without departure from the spirit of the present invention.

The present invention has among its objects, the provision of a net compression Bowden wire remote control structure. In addition, the present invention is directed toward greatly simplified actuation and accessory structure utilizing the net compression.

A further object is to provide a structure wherein the compression applying plates are movable toward and away from the terminal ends of the compression transmitting core piece.

Finally, the invention has as its object, an actuator and accessory structure wherein the compression receptacles for each end of Bowden wire core elements require no attachment other than mere socketing so as to minimize costs, and simplify installation and maintenance factors without sacrifice in precision of performance. Collateral advantages in reduction of unit complexity will be readily appreciated.

Other objects will be apparent to those skilled in the art as the description proceeds.

In the drawings:

FIGURE 1 is a schematic perspective view of a three rod compression system for achieving an opposite and equal mimic control as between an actuator and a controlled element and wherein the rods illustrate the requisite rigidity for net compression actuation.

FIGURE 2 is an accessory shown, for example, as a rearview mirror wherein flexible compression carrying members provide control while being unattached, physically to the mirror element.

FIGURE 3 is an actuator unit in rear plan view serving a three wire control system as viewed from behind a mounting or dash panel.

FIGURE 4 is a sectional elevation view taken on line IV—IV of FIGURE 3 and indicating the stark simplicity of the actuator element applying net compression to the Bowden wire core pieces at the actuator end.

FIGURE 5 is a front elevation view of a modified mirror accessory wherein spring means are avoided at the accessory element.

FIGURE 6 is a side elevation partial section view of the structure of FIGURE 5 indicating the use of a rigid compression applying element operative at the universal pivot.

General description

In general, the present invention comprises a new and improved actuator capable of simple application of compressive force to the terminal ends of plural Bowden wire core elements. The invention also comprises a combination of compression imparting actuator and compression imparting accessory, the compression applied by each of the actuator and accessory elements serving to operably detent and locate the application of the corresponding opposite ends of the core pieces in avoidance of physical attachment to either actuator or accessory. Structurally, the actuator and accessory are arranged to press against each other through the connecting medium of the compression transmitting core pieces. The automobile body or boat hull becomes a rigid fixture separating accessory from actuator. The compression is applied by either rigid or resilient means and hence the compression imparting plates are merely provided with receptacles to detentably receive the terminal ends of the Bowden wire core pieces. At each of the actuator and accessory plates, the plates are made relatively movable toward and away from each other thereby adjusting compression applied to the core pieces at the ends thereof. This is accomplished by threaded means as will be seen. As the actuator is moved in these structures, corresponding and opposite movement is imparted to the control element.

While generally the finest precision has been found in three wire systems, any plural wire control structure using Bowden wire connecting means under compression is included in the spirit of the present invention. Simple adjustment of compression is accomplished at either the actuator or the accessory or both. Two wire systems are also accommodated where the counterforce of a spring bias, for example, substitutes for three wire actuation.

Specific Description

By reference to the drawing and with particular reference to FIGURE 1, the concept of the present invention is best appreciated. Consider handle 11 as rigidly secured to the disc 12. The disc 12 is provided with plural detent pockets 13. In an equal and opposite sense, the handle 11' is provided remote from handle 11. The disc 12' is also similar and opposite to the disc 12 and is provided with corresponding pockets 13'. Intermediate the discs 12 and 12' are compression rods 14, considered as rigid elements and each locating in the respective corresponding receptacles or pockets, 13 and 13'. If the discs 12 and 12' are moved away from each other, the rods 14 would fall free. If, however, the rods 14 are under compression by application of axially applied force from discs 12 and 12', then the system is secure and movement of disc 12 by handle 11 will cause corresponding and opposite movement in disc 12' and handle 11' as shown in phantom line. While in this movement there is an application of imbalance to accomplish motion, the net compression overrides the momentary alternate tension and compression during movement so that no lost motion occurs and so that the motion is accordingly smooth and tight. A limited universal movement in the handle 11 is seen to accomplish an equal and opposite universal movement in the remote handle 11'. The present invention utilizes these simple considerations in providing a remote control structure for a variety of apparatus, modified by the utilization of a core wire instead of a rod wherein the core wire is capable of movement through a relatively short stroke without deformation while being sufficiently resilient to be tortuously threaded through a non-direct path intermediate the actuator and accessory. This being true, an exact action in the actuator element is reproduced by direct corresponding motion in the remotely positioned accessory. In brief, the core pieces must be sufficiently stiff to resist deformation by the compression forces and through their unsupported lineal stroke sufficiently flexible so that they may be bent about obstacles without destruction of the effective compression stroke. Accordingly, the analogy, by reference to the rods 14, is not intended to limit the core wire material to a solid bar or rod. At proper rigidity, stranded or cable type cores are also usable when properly sheathed and preferably tipped so as to avoid fraying of the terminal ends.

By reference to FIGURE 2 three Bowden wire core pieces 15, 16 and 17, each of them having sheath windings 18, 19 and 20, and considered stressed by application of an equal compression are connectably positioned to serve the accessory 21 illustrated as an automotive rear-view mirror. The mirror glass or reflective element 22 is framed by a backing plate 23 located in an open ended mirror cover 24. The cover 24 may be made a part of the entire housing 25, as shown, or may constitute a separate element as desired by the aesthetics or economy of a particular mirror structure. In FIGURE 2 the housing 25 and cover 24 are integral.

The housing 25 is ordinarily secured to the hull of a boat or to the body of an automobile, not shown. The housing 25 is provided with an access cavity 26 through which the sheathed core wire elements 15, 16 and 17 are passed. A support web 27 is interposed transversely across one end of the cavity 26 and generally the web 27 is parallel to and spaced from the normal accessory position shown. Normal position as used herein has reference to a centering of the axis of movable element

23 as shown in accord with a corresponding centering of the axis of the actuator handle as seen in FIGURE 4. The web 27 is provided with sheath receiving sockets 28 which snugly receive the sheath elements 18, 19 and 20. Coaxial with the sockets 28 are openings 29, of reduced diameter through which the core elements 15, 16 and 17 are passed. In general, the class of fit preferred is a running fit allowing the core pieces 15, 16 and 17 to reciprocate axially therein.

The back piece or movable framing piece 23 of the reflective element 22 is upset to provide pockets 30 into which the free terminal ends of the core wires 15, 16 and 17 extend. The pockets 30 thus provide detent-like receiving receptacles for the terminal ends of the core pieces 15, 16 and 17. The pockets 30 are symmetrically arranged to registably and transversely intersect the projection of the core pieces 15, 16 and 17 on the axes defined by the openings 29. A tension spring 31, located centrally in respect to the pockets 30 is secured at one end to the movable mirror frame 23 and at the other end to the fixed housing 25. This is accomplished by the integral loop 32 in frame 23 and by the pin 33 provided transversely through the spring recess 34 in the web 27.

As illustrated in FIGURE 2, the reflective element 22 along with its framing 23 is thus urged into tight contact against the terminal ends of the core pieces 15, 16 and 17. The framing 23 is thus seen suspended on the tips of the core wire elements 15, 16 and 17 and the tips are secured against lateral displacement by detent location in the pockets 30. Where desirable, hardened cups (not shown) may be used to extend the life of the pockets 30 or with flanges to form the pockets 30. Axial movement in the core pieces 15, 16 and 17 causes selected displacement of the movable frame 23. The sheath pieces 18, 19 and 20 are socketed in the openings 28 of the web 27. Where desired, the sheaths may be clinched in position against any tension tendency to dislodge them from position.

As appreciated, this application of compression to the core pieces 15, 16 and 17 requires countering application of force. In FIGURE 3 the actuator 35 of the present invention is shown as secured in the panel 36 of, for example, an automobile dash or boat control panel. The actuator 35, like the web 27 in the accessory 21, is provided with a sheath receiving spider 37. The spider 37 is pierced transversely to provide a plurality of sheath receiving receptacles 38 into which the ends of the sheath elements 18, 19 and 20 are inserted. Where desirable, these receptacles 38 may be crimped inwardly to clinch the ends of the sheaths 18, 19 and 20. These also provide shouldering for the terminal end of the sheath elements 18, 19 and 20. Smaller coaxial openings 39 provide a running fit for the core pieces 15, 16 and 17, better seen in FIGURE 4. The core pieces 15, 16 and 17 thus extend through the spider 37 and into terminal engagement with a wobble plate 40 in normal spaced parallel relation with the plane of the spider 37, as shown. Terminal and receiving pockets 41 are provided in the wobble plate 40 in axial register with the openings 29. The openings 29 provide bearing means through which the core pieces 15, 16 and 17 extend. Upon assembly, the terminal ends of the compression transmitting core pieces 15, 16 and 17 are thus detentably secured in the pockets 41 of the wobble plate 40. The wobble plate 40 thus selectively transmits motion to the core pieces 15, 16 and 17 by axial displacement of the core pieces 15, 16 and 17 while the pockets 40 restrain lateral displacement. The wobble plate 40 is secured as by screw 42 or other suitable fastener to the center axis of a generally hemispheric element 43. A handle piece 44 axially extends from the hemispheric element 43. An annular bearing plate 46 is provided having a central opening 45 therethrough and through which opening 45 the handle piece 44 extends. The bearing plate 46 is adjustable axially of the opening 45 by relatively rigid means as for example by threads to force

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the mating spherical female seat 45 at the opening in bearing plate 46 into firm engagement with the male spherical portion 43. This adjustment, when in the direction of the core elements 15, 16 and 17, pushes the wobble plate 49 into tight relation against the terminal ends of the core pieces 15, 16 and 17 thereby applying compression to the core pieces 15, 16 and 17. As shown in FIGURE 4 this adjustment is relatively rigidly accomplished by use of a nipple 47 passed through the opening 48 in the dash panel 36. The nipple 47 thus provides a threaded coupling for the spider 37 on one side of the panel 36 and also a common threaded coupling for the annular cover flange 49. As will be seen, the cover flange 49 engages the peripheral flange 50 of the bearing plate 46 and is also threaded on the nipple 47 into flush engagement with the dash panel 36. Adjustment of these threaded relations on the nipple 47 permits the bearing plate to be moved axially into greater and lesser engagement with the hemispheric surface 43, thus increasing or decreasing compression applied to the core pieces 15, 16 and 17 by the wobble plate 40. The mating spherical surfaces 43 and 45 are thus seen to comprise a limited universal structure which is adjustably positioned by the means described. As will be appreciated, resilience may be designed into the wobble plate 40 and into the bearing plate 46 by utilizing, for example, spring stock thus combining in structural components the function of springs usually a part of parallel type prior art devices. Prior elaborate use of die cast elements is thus avoided.

Referring to FIGURE 5 a modified accessory form is shown which is preferred in usage with the actuator 35 of FIGURE 4. The principal difference lies in the adjustable axis universal 51 so that as the actuator 35 may be used to apply a threaded adjustment of compression to the core pieces 15, 16 and 17 by relative axial extension of the universal formed by surfaces 43 and 45, so the axial movement of the universal 51 imparts a pressure adjustment to the terminal ends of the elements 15, 16 and 17 at the accessory 52. By reference to FIGURE 6 the simplicity of the accessory 52 will be appreciated. The reflective member 53 is framed, as in the structure of FIGURE 2 by a back and frame 54. The back 54 is provided with pockets 70 for registrably receiving the terminal ends of the compressed core pieces 15, 16 and 17. At center, however, in contrast to the use of a tension spring 31, a threaded post 56 is provided. On the unthreaded end of the post 56 a spheroidal surface 57 is provided over which a mating spheroidal portion 58 of the back 54 is positioned and against which the post 56 may pull so as to provide the limited universal 51 adjustable on the axis of the post 56. The post 56 is threaded into the housing element 59. An access opening 60 for movement of the post 56 is provided through the housing element 59. The housing element 59 provides a web portion of the housing 61. The housing element 59 is thus positioned parallel to and spaced apart from the plane of the reflective member 53 when in normal position as shown. The housing element 59 is fitted into the housing 61, is keyed thereto as by key 62 in keyway 63 and the housing element 59 and being secured against axial displacement by snap ring 64.

The housing 61 is provided with a mounting base 65, a pedestal portion 66 and an internal cavity 67 through which the sheathed core wire elements 15, 16 and 17 obtain access to the housing element 59. Sheath recesses 68 are provided transversely and partially through the housing element 59 and receive the ends of the sheaths 18, 19 and 20. Openings 69, of reduced diameter and on the common axis of the openings 68, extend through the housing element 59 providing running fit bearings for the core wire pieces 15, 16 and 17. The core pieces 15, 16 and 17 thus extend through the openings 69 and axially extend therefrom into contact with the back framing 54. At contact with the back 54, pockets 70 registrably receive and confine the terminal ends of the core

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pieces 15, 16 and 17 against lateral displacement. As previously indicated with respect to the pockets 30 and 41, hardened cups may be used as liner inserts or form the pockets 70. As will be appreciated, the post 56 draws the back 54 into contact with the ends of the wire members 15, 16 and 17 providing an adjustable and relatively rigid contact for application of compression to the core piece elements. The sheath recesses 68 may be crimped to positively hold the sheath elements 18, 19 and 20. As pointed out in respect to the web 27 (FIGURE 2) and the spider 37 (FIGURE 4) the crimping is desirable where the compression applied to core pieces 15, 16 and 17 causes a corresponding tension in the sheaths 18, 19 and 20. Set screws may be employed but cost is increased thereby.

While the reflective elements 22 and 53 have been generally illustrated as circular, it will be appreciated that the reflective members may be of other configuration, for example, oval or even rectangular. The housing elements for the reflective members may be greatly altered in accord with aesthetic and design considerations. Field adjustment of compression is greatly facilitated by movement of the post 56 on its mating thread or by lock nut type adjustment at the actuator 35 as previously described. In the FIGURE 2 structure, adjustment at the accessory is resilient or non-rigid in accord with the range of tension spring 31.

Operation

In operation, in contrast to most prior art structures in the general class, the actuator and accessory mounting may be substantially complete before installation of the elongate core wire pieces in their sheaths. These may then be located and, without securing to the actuator or accessory, are suitably positioned, cut to size, then with their sheaths socketed at each end, the terminal ends are socketed and the actuator and accessory are adjusted to apply a net compression. Deformation tendencies in the courses of wires and their sheaths are controlled by an overwrap sheath binding the courses together and by stapling or otherwise securing the bundle of wires at intervals along the selected installation path. Sufficient flexibility in the elongate wire cores and their wrapper or sheath exists so that 8 to 10 inch radii bends are accomplished without serious interference with performance. Sharper bends through limited angles are possible.

Accordingly, great savings are experienced in the character of the terminal contact structures such as actuator and accessory elements. Assembly, disassembly and service is more easily accommodated and rigid adjustments at each end provide substantial improvements in the application of net compression to the core pieces. Lost motion is eliminated when proper net compression is applied and tensions in the system operate on the sheaths or sleeves of the core pieces. Considering the core pieces themselves, the compression type core using, for example, a spiral wound outer wrapped sheath is very economical and in compression usage is more amenable to sizing and fitting than more resilient materials for example, under tension, where elongation under tension becomes a considerable factor.

The life of structures in accord with the present invention is very good and structures in accord with the invention have adequate "sticking" characteristics so that when an adjustment is accomplished vibrational dislodgment is rare. Field adjustment is easy if some "float" is observed.

Accordingly, I have fully described one operative embodiment of the present invention and a modification indicating the adaptation of a relatively rigid compression bias at the accessory. Other embodiments, improvements, changes and modifications will occur to those skilled in the art upon a full appreciation of the present invention. Such embodiments, improvements, changes and modifications within the spirit of the invention are intended to be included herein limited only by the scope of the hereinafter appended claims.

I claim:

1. In a remote control structure for rearview mirrors and the like, a compression actuator comprising:

- (a) a wobble plate;
- (b) receptacles on said wobble plate;
- (c) a spherical member extending from said wobble plate;
- (d) a mating annular bearing plate, a part of said wobble plate engaged with said spherical member and completing a universal joint;
- (e) a plurality of elongate compression transmitting members engaged at their terminal ends in the receptacles of said wobble plate; and
- (f) threaded means adjusting relative equal contact between said elongate compression transmitting members and said wobble plate.

2. In a remote control structure for rearview mirrors and the like, an actuator comprising:

- (a) a wobble plate;
- (b) receptacles on said wobble plate comprising pockets;
- (c) a hemispheric element secured to said wobble plate on an axis transverse to the surface of said plate;
- (d) an annular hemispheric socket mating with said hemispheric element and together with said hemispheric element forming a universal joint;
- (e) a handle through said socket secured to said hemispheric element;
- (f) a plurality of compression receiving lineally movable core pieces, the terminal ends of which are compression engaged in said receptacles against lateral displacement; and
- (g) means urging said socket and said hemispheric element into snug bearing contact and said wobble plate into engagement with said terminal end of said core pieces.

3. In a remote control structure for net compression actuation of rearview mirrors and the like, the combination comprising:

- (a) an accessory element;
- (b) a back plate upon said accessory element having receptacles therein;
- (c) an actuator element remote from said accessory element;
- (d) a wobble plate having corresponding receptacles therein as in said back plate;
- (e) a plurality of elongate sheathed core wire elements intermediate said back plate and said wobble plate the terminal ends of which are inserted in corresponding receptacles of said back plate and said wobble plate; and
- (f) means connected intermediate said actuator and said accessory element comprising said core wire elements against said back plate and said wobble plate.

4. In the combination set forth in claim 3 wherein the means compressing said core elements is threaded.

5. In the combination set forth in claim 3 wherein the means compressing said core elements is resilient.

6. A remote control mimic structure of Bowden wire type wherein the core wire elements are maintained under a net compression, the combination comprising:

- (a) an actuator member;
- (b) a universal structure in said actuator member;
- (c) a threaded means moving the relative position of said universal structure;
- (d) a wobble plate movable with said universal structure;
- (e) a plurality of core wire pieces, the terminal ends of which core wire pieces at one end are engaged transversely with said wobble plate, said core wire pieces being engaged or disengaged by movement of said threaded means;
- (f) a remotely positioned accessory;
- (g) a back plate upon said accessory;
- (h) means on said back plate receiving the other of the terminal ends of said core pieces; and

(i) means urging said back plate into pressure engagement with the terminal ends of said core pieces.

7. In the combination set forth in claim 6 wherein the means urging said back plate is an adjustable threaded means connected to said back plate.

8. In a remote control structure for rearview mirrors and the like, the combination comprising:

(a) an actuator having a wobble plate, a universal socket supporting said wobble plate, threaded means moving said universal socket position, a handle for movement of said wobble plate in said universal socket, and a spider defining plural openings there-through in adjustable spaced oriented relation to said wobble plate;

(b) a plurality of sheathed elongate core wire members, one set of the ends of which are oriented by said spider to contact with said wobble plate, and the other ends of which transmit compression and relative movement in accord with selected positioning of said wobble plate; and

(c) an accessory remotely positionable from said actuator comprising a member in compression contact with said other of said ends of said elongate core wires, a sheath receiving and core wire orienting web in spaced generally parallel relation to said accessory member and through which said core wires pass, and means urging said accessory member into compression contact with said terminal ends of said core wire members.

9. In the combination of claim 8 wherein said means urging said movable member into contact with said terminal ends of said core wires are resilient.

10. In the combination of claim 8 wherein said means urging said movable member into contact with said terminal ends of said core pieces is rigid.

11. In the combination of claim 8 wherein said wobble plate in said actuator and said movable member in said accessory are provided with pockets confining said ends of said core wire pieces from lateral displacement.

12. A remote control structure for rearview mirrors and the like comprising:

(a) a wobble plate having a plurality of radially disposed receptacles and central journal means;

(b) a back plate remote from said wobble plate having a plurality of radially disposed receptacles and central journal means;

(c) a pair of hemispheric bearings, one disposed against said central journal means of said wobble plate and the other disposed against said central journal means of said wobble plate whereby said back plate and said wobble plate are limitedly and universally pivoted;

(d) a plurality of resilient sheathed core elements interposed between said wobble plate and said back plate, each of the ends of each of said core elements, respectively, engaged in said receptacles in said wobble plate and said back plate and compressibly securing said plates snugly against said bearings whereby movement in one of said plates results in corresponding movement in the other of said plates.

13. A compression type remote control for rearview mirrors and the like comprising:

(a) a wobble plate having a plurality of receptacles radially arranged about a center;

(b) a hemispheric bearing against which said wobble plate bears at center of said wobble plate;

(c) a back plate remote from said wobble plate and having a plurality of receptacles radially arranged about a center;

(d) a second hemispheric bearing against which said back plate bears at center of said back plate;

(e) a plurality of elongate sheathed core wires each of said core wires engaged at their respective ends in said receptacles of said wobble plate and said receptacles of said back plate; and

(f) means urging said back plate and said wobble plate against said ends of said core wires thereby equally compressing said core wires and urging said back plate and said wobble plate securely against said hemispheric bearings whereby said core wires are subjected to an equal compression at all times and wherein movement of one of said plates causes equal corresponding movement in the other of said plates.

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BROUGHTON G. DURHAM, *Primary Examiner*.

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,183,736

May 18, 1965

Edwin B. Jacobson

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 7, line 35, for "end" read -- ends --; line 49, after "of", first occurrence, insert -- said --; same column 7, line 52, for "comprising" read -- compressing --.

Signed and sealed this 12th day of October 1965.

(SEAL)

Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents