Oct. 16, 1945. C. A. ARENS 2,386,767

CONTROL MECHANISM

Filed June 24, 1942

Fig. 1.

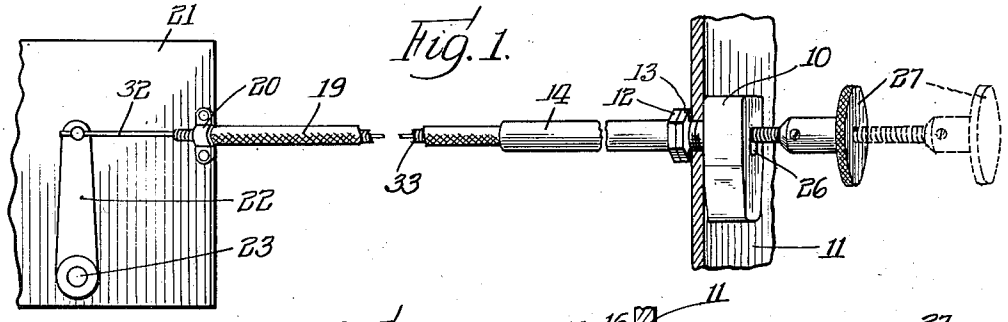


Fig. 2.

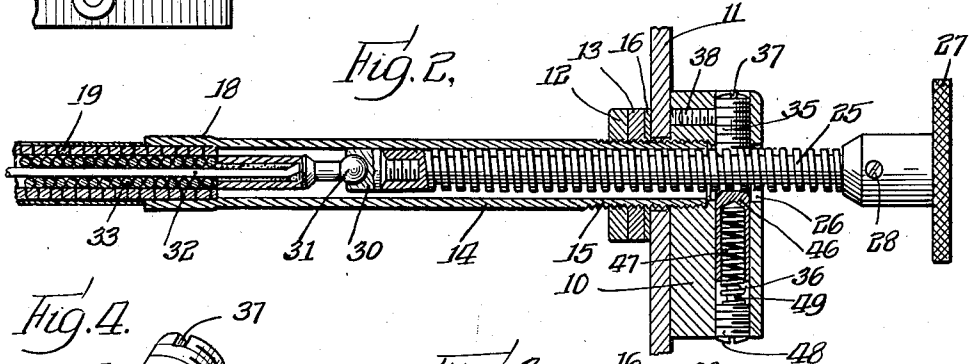


Fig. 4.

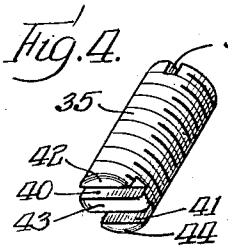


Fig. 3.

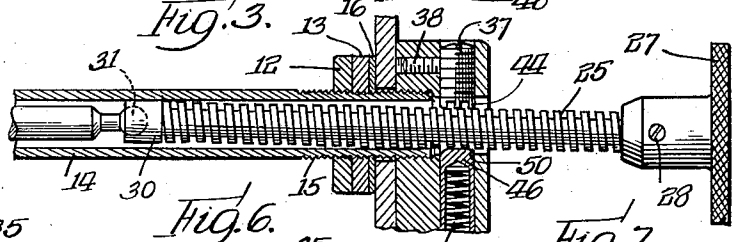


Fig. 5.

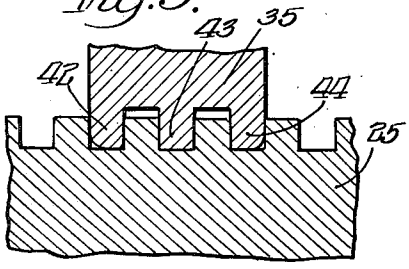


Fig. 6.

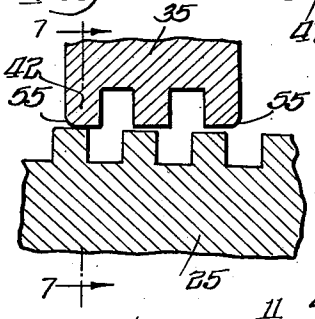


Fig. 7.

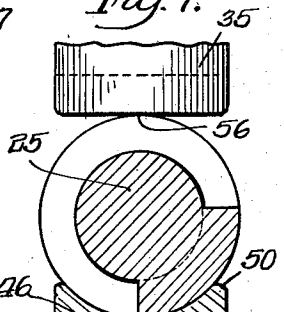


Fig. 9.

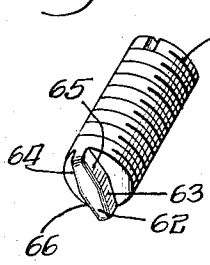
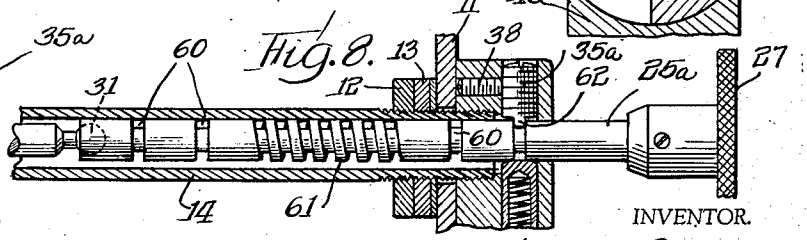


Fig. 8.



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CONTROL MECHANISM

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Application June 24, 1942, Serial No. 448,263

14 Claims. (Cl. 74—502)

This invention relates to control mechanisms, particularly of the manually operated type adapted for longitudinal reciprocation.

It is an object of the invention to provide a control mechanism of the type stated which is of improved construction and operation, and more specifically to provide an improved manually operable reciprocating control mechanism wherein the manually operable control member is adapted for accurately controlled vernier or micrometer adjustments in various of its shifted positions, while at the same time being releasable for relatively free and rapid movement throughout its range of travel.

A further object of the invention is to provide a control mechanism of the above specified type wherein the control member is readily releasable for its relatively free and rapid movements, and wherein the control member is smooth in operation.

A still further object of the invention is to provide a control mechanism of the manually operable, longitudinally reciprocating type having improved means for effecting the locking of the control member at accurately predetermined stations along its path of travel, means being additionally provided, if desired, for effecting the vernier or micrometer adjustments of the control member at other predetermined stations.

Various other objects, advantages and features of the invention will appear from the following specification when taken with the accompanying drawing wherein certain preferred embodiments of the invention are set forth for purposes of illustration.

In the drawing, wherein like reference numerals refer to like parts throughout:

Figure 1 is a general assembly view of a control mechanism constructed in accordance with the principles of the invention and embodying the features thereof.

Figure 2 is a longitudinal sectional view through a portion of the control mechanism of Figure 1, on an enlarged scale.

Figure 3 is a view similar to Figure 2, but showing the control member released for its relatively free and rapid movement.

Figure 4 is a detail perspective view of the reactance member forming a part of the control mechanism.

Figure 5 is a detail illustrative view, on a considerably enlarged scale, showing the manner of cooperation between the reactance member and the control member, when the latter is in its normal position and adapted for vernier or micrometer movements.

Figure 6 is a view similar to Figure 5 but showing the control member in released position as when adapted for its free and rapid movements.

Figure 7 is a transverse sectional view of the reactance and control members, and the associated control member engaging means, the view being taken as indicated by the line 7—7 of Figure 6.

Figure 8 is a view generally similar to Figure 2, but showing a modified embodiment of the invention.

Figure 9 is a detail perspective view of the reactance member as used with the embodiment of the invention illustrated in Figure 8.

Referring more particularly to the drawing, and first to the embodiment of the invention illustrated in Figures 1–7, the control mechanism illustrated is of the type wherein a manually operable, longitudinally reciprocable control member is connected to operate an elongated transmission mechanism which in turn is connected to operate the device to be controlled. It is to be understood, however, that the invention in its various aspects is adapted for use with other types of control mechanisms, including mechanisms having other types of longitudinally shiftable members adapted for either vernier movements or relatively free and rapid movements, as may be desired.

Referring to Figures 1, 2 and 3, the structure illustrated comprises a housing 10 adapted to be anchored to or mounted upon a panel 11 by means of a pair of nuts 12 and 13, and a frame sleeve 14. More specifically, the frame sleeve is provided with a threaded end portion 15 adapted for engagement with a threaded counterbore in the housing, the nuts 12 and 13 also being threaded onto the sleeve portion 15 in a manner so as to clamp the panel 11 between the housing and the nuts. A washer 16 is interposed between the nuts and the panel. The panel may, for example, be the dashboard or instrument panel of an automotive vehicle or aircraft as where the control mechanism is used in a structure of this character.

The opposite end of the frame sleeve 14 is provided with an enlargement 18 to which one end of the flexible sheath 19 of a flexible cable structure is anchored. The sheath 19 may, for example, comprise a wire coil or the like, as is customary in flexible cable structures. The opposite end of the sheath is anchored to a bracket 20 mounted upon a panel 21 associated with the

device 22 to be controlled. The controlled device as illustrated is in the form of a lever pivotally mounted at 23 upon the panel 21, and adapted for connection with the control mechanism.

The shiftable elements of the control mechanism, for controlling the position of the lever 22, comprise a control member 25 reciprocable within the frame sleeve 14 and the housing 10, through an opening 26 in the housing in line with the counterbore into which the frame sleeve 14 is threaded. The control member 25 is in the form of an elongated screw, provided with a helical screw thread substantially along its entire length. One end of the control member carries a handle or knob 27 removably secured to the end of the control member by means of a set screw or the like 28. The opposite end of the control screw or control member 25 is provided with a threaded counterbore into which the socket member 30 of a ball and socket structure is threadedly secured. The ball part or member 31 of the ball and socket structure is in turn anchored in suitable manner to the end of a wire 32 and associated wire coil 33, the wire 32 and wire coil 33 being shiftable bodily within the flexible sheath 19. As shown in Figure 1, the end of the wire 32 is secured to the lever 22 to effect the actuation thereof. It will be seen that as the control member 25 is longitudinally positioned within the frame sleeve 14 and associated housing 10, the lever 22 to be controlled will be correspondingly positioned. Further, by reason of the ball and socket connection 30, 31, the control member or screw 25 may be pivoted relative to the end of the wire 32, and also rotated relative thereto, without imparting a corresponding rotation to the wire.

As best shown in Figures 1 and 2, the internal diameter of the frame sleeve 14 is somewhat larger than the external diameter of the screw member 25, the bore 26 of the housing also being somewhat larger than the screw, whereby to permit the screw to be pivotally moved from its normal horizontal position as indicated in Figure 2 to a somewhat angularly disposed position, as shown in Figure 3. As indicated in Figure 1, the bore or opening 26 of the housing is preferably of oval shape, having its major dimension vertically disposed, so that the opening may relatively closely embrace the screw at the sides while permitting its vertical shifting as stated.

A reactance member 35 is screw-threaded into a threaded bore 36 in the housing 10, extending vertically therethrough as best shown in Figures 2 and 3. The reactance member is generally in the form of a set screw or the like, and is shown in perspective detail in Figure 4. At its upper end, the reactance member is provided with a kerf or slot 37 by means of which it may be threaded into the bore of the housing and brought to any desired predetermined rotational position. A positioning or anchoring screw 38 is threaded into a horizontal counterbore in the housing 10, the arrangement being such that after the reactance device or screw 35 has been brought into the desired position, as shown in Figures 2 and 3, the positioning or anchoring screw 38 may then be screwed into locking engagement with the reactance screw to hold it in its adjusted position. This adjustment of the screws may be made before the housing is mounted upon the panel 11.

As indicated in Figures 2, 3, and 4, the lower end of the reactance member 35 is provided with a pair of transverse slots 40 and 41 whereby to provide a plurality of transverse projections or teeth 42, 43, and 44 engageable with the screw thread of the control member 25. When the reactance screw 35 is in assembled position, it is so arranged that the projections 42, 43 and 44 thereof assume a pitch corresponding to the pitch of the screw 25, for cooperation therewith.

The lower end of the threaded bore 36 of the housing carries locking or engaging means for normally resiliently urging the screw 25 upwardly into the position shown in Figure 2, in locking engagement with the projections 42, 43 and 44 of the reactance member. This locking or engaging means comprises a slide member 46 vertically reciprocable within the bore 36 of the housing, and provided with a counterbore for the reception of a compression spring 47. The spring is urged into engagement with the slide member by means of a threaded plug 48 screw threaded into the housing bore 36 and provided at its upper end with a projection 49 around which the end of the spring is positioned. By threaded adjustment of the plug 48, the slide 46 may be resiliently urged upwardly by means of the spring providing a predetermined pressure engagement against the control screw 25.

The upper end of the slide 46 may be relieved slightly at its peripheral edge 50, so as to insure smooth engagement with the screw member 25.

The manner of cooperation between the control member 25 and the associated reactance member 35 with which it is selectively engageable, is illustrated in detail in Figures 5, 6 and 7. Figure 5 shows the engaged position of the parts corresponding to Figure 2, whereas Figure 6 shows the disengaged position of the parts corresponding to Figure 3. Referring to Figure 5, it will be seen that when the control screw and reactance member are in engaged position, the vertically disposed side walls of the screw thread and of the projections 42, 43 and 44 provide positive locking resistance against longitudinal movement of the control member. In this position of the parts, the control member 25 may be rotated, whereupon, by reason of the screw threaded engagement with the reactance member, vernier or micrometer adjustments or movements will be imparted to the control wire 32 and the lever 22. At the same time, the engaging means or slide member 46 holds the parts in engaged or interlocked position, so that even relatively heavy stresses applied to the wire 32 will cause no disengagement or inadvertent longitudinal shifting of the control member. In most instances, it is desirable to provide substantially vertical side walls on the screw thread and the projections 42, 43 and 44, although it is to be understood that if desired the side walls may be of somewhat V-shape, or relieved at the crown portions of the projections and the thread, so that a predetermined longitudinal force applied to the control wire will effect an automatic release of the threaded engagement between the parts, the engaging slide 46 in such instances being thrust downwardly against the action of its compression spring 47.

Attention is further directed to the peripheral relief 55 provided on the end of the reactance member so that as the control member is thrust downwardly by handle 27 into disengaged position, and thereafter shifted longitudinally, smooth operation is provided. This will be best under-

stood by reference to Figure 6, wherein it will be seen that the relief 55 of the projection 42 insures that as the control lever 25 is shifted to the right, smooth engagement between the projection 42 and the successive convolutions of the screw thread will take place. This feature is of particular desirability when the handle 27 is not thrust downwardly by the operator sufficiently to effect complete disengagement between the parts, and thereupon pulled outwardly or to the right as seen in Figures 2 and 3.

Attention is further directed to the fact, as best shown in Figure 7, that the end of the reactance member which cooperates with the screw thread of the control member is substantially flat except for its grooves and projections, whereby to facilitate ready disengagement of the parts, and also to provide substantially surface engagement at the initial contacting point. Thus, referring to Figure 7, it will be seen that as the parts are brought into engagement, substantially surface contact is provided therebetween as indicated at 56. Also, it will be seen that to move the control member 25 from completely engaged to completely disengaged position requires only that the control member be shifted vertically a distance corresponding to the radial depth of the screw thread, or the depth of the slots 40 and 41 provided on the reactance member. If the lower end of the reactance member were concavely shaped, a greater shifting of the control member would be required between engaged and disengaged position, with attendant difficulties.

The operation of the structure is believed to be clear from the foregoing. With the parts in the position shown in Figure 2, rotation of the control member 25 imparts micrometer or vernier control adjustments to the wire 32. Upon depression of the control member 25 to its Figure 3 position, it may be freely longitudinally shifted to impart a rapid and relatively free shifting to the wire 32.

In Figures 8 and 9 an embodiment of the invention is illustrated generally similar to that shown in Figures 1–7 but incorporating certain modifications. More specifically, in this instance, the control member 25*a* is provided at spaced intervals with annular grooves 60, the control member additionally being screw threaded as indicated at 61 between selected annular grooves.

The reactance member 35*a* is in this instance provided with but a single extension 62, this extension being shaped for cooperation with either the screw thread 61 or the annular grooves 62. To this end, as best shown in Figure 9, the extension 62 is provided with surfaces 63 and 64 adapted for cooperation with the screw thread, and surfaces 65 and 66 adapted for cooperation with the annular grooves.

When the reactance member is brought selectively into engagement with one of the annular grooves 60, the control member 25*a* will be maintained in accurately predetermined position regardless of rotation. On the other hand, when the reactance member is in engagement with the screw thread 61, rotation of the control member will impart micrometer control movements to the structure as in the embodiment of the invention illustrated in Figures 1–7. Obviously, the pattern of the annular grooves and the screw thread may be varied to suit the requirements of any particular installation, or the annular grooves may be used independently.

It is obvious that various changes may be made in the specific structural embodiments set forth for purposes of illustration, without departing from the spirit of the invention. The invention is accordingly not to be limited to the specific embodiments shown and described but only as indicated in the following claims.

The invention is hereby claimed as follows:

1. A control mechanism comprising a reciprocable control member, a reactance member, said control member being in the form of a shaft provided with an external longitudinally extending screw thread and said reactance member having means formed thereon for interlocking engagement with the screw thread, and means comprising a manual control handle secured to the shaft member for shifting said shaft member laterally to effect the selective engagement and disengagement thereof from the reactance member, said members being shiftable between engaged and disengaged positions by a movement no greater than the depth of said screw thread.

2. A control mechanism comprising a reciprocable control member, a reactance member, one of said members being cylindrical in shape and provided with an external longitudinally extending screw thread, and the other of said members having a substantially flat end surface provided with grooves for interlocking engagement with the screw thread, and means for laterally shifting the screw threaded member to effect the selective engagement and disengagement thereof from said other member.

3. A control mechanism comprising a control member, said member being of general cylindrical shape and provided with an external longitudinally extending screw thread, a stationary reactance member, said reactance member comprising a stud-like member having a relatively flat end surface provided with a projection adapted for interlocking engagement with the screw thread, means for shifting the control member to effect its selective engagement with and disengagement from the reactance member, and means for rotating the control member.

4. A control mechanism as defined in claim 3, wherein said reactance member is adjustably rotatable to position its interlocking projection to conform to the pitch of the control member screw thread.

5. A control mechanism as defined in claim 3, wherein said reactance member is adjustably rotatable to position its interlocking projection to conform to the pitch of the control member screw thread, and wherein screw threaded means is provided for locking the reactance member in a rotatably adjusted position.

6. A control mechanism comprising a housing, said housing being provided with a pair of bores disposed in substantially right angular relation, a control member extending through the housing through one of said bores, said member being provided with a longitudinally extending screw thread, a stud positioned in one portion of the other of said bores, said stud having means formed on the end thereof adapted for interlocking engagement with the screw thread, and a spring-urged abutment member positioned in another portion of said other housing bore in resilient engagement with the control member and operative to urge the control member into resilient engagement with the stud, means for shifting the control member against the action of said abutment member to effect the selective engagement and disengagement of the control member and the stud, and means for rotating the control member.

7. A control mechanism comprising a frame

housing, a housing sleeve adapted to be secured to said frame housing, said frame housing having a pair of bores in substantially right angular relation, an elongated control member rotatable and longitudinally reciprocable within said sleeve and within one of the bores of the frame housing, said control member being provided with a screw thread along a portion of its length, a reactance member supported in fixed relation with respect to said sleeve in the other bore of the frame housing, said reactance member having means formed thereon for interlocking engagement with the screw thread, means for laterally shifting the control member to effect selective engagement and disengagement with the reactance member, a flexible sheath comprising a wire coil one end of which is fixedly secured to the housing sleeve, an elongated transmission member longitudinally shiftable within said flexible sheath, and universal connecting means connecting the end of said elongated transmission member to the end of the control member.

8. A control mechanism comprising a control member, said member being of general cylindrical shape and provided with a longitudinally extending screw thread, a housing provided with a bore through which said control member is adapted to extend, said housing being also provided with a second bore angularly disposed with respect to the first named bore and provided with a screw thread, a stud-like reactance member disposed in said second bore and having adjustable screw threaded engagement therewith, said reactance member being provided with a projection adapted for interlocking engagement with the screw thread, means for shifting the control member to effect its selective engagement with and disengagement from the reactance member, and a set screw carried by the housing and adapted to engage the stud-like reactance member whereby to lock it in position and hold its screw thread engaging projection in predetermined angular position.

9. A control mechanism comprising a control member, said member being of general cylindrical shape and being provided with a longitudinally extending screw thread along a certain portion of the length thereof and with an annular groove at another longitudinal portion thereof, a stationary reactance member, said reactance member having means thereon adapted for interlocking engagement selectively with said screw thread or said annular groove, and means for shifting the control member to effect its selective engagement with and disengagement from the reactance member, said control member being adapted for longitudinal shifting and for rotating movements.

10. A control mechanism comprising a housing, said housing being provided with a bore extending therethrough, an elongated control member arranged within said bore, said control member being of general cylindrical shape and being provided with a longitudinally extending screw thread, a second cylindrical bore in said housing disposed substantially perpendicularly to the first bore, a stud-like reactance member arranged within said second bore, said reactance member being provided with a projection adapted for interlocking engagement with the screw thread of the control member, means for bodily shifting said control member to effect its selective engagement with and disengagement from the reactance member, and a third bore arranged in the housing also substantially perpendicularly disposed in reference to the first housing bore, and a compression spring arranged in the third bore and adapted to urge the control member into engagement with the stud-like reactance member.

11. A control mechanism comprising a frame, said frame being formed with an elongated tube-like portion, a control member reciprocable with respect to the frame and within said tube-like portion, a flexible coil sheath fixed at one end to said frame tube-like portion, a control cable shiftable within the sheath and fixed at one end to said control member, a reactance member fixed to the frame, said reciprocable control member being elongated and being provided with a longitudinally extending screw thread and the reactance member having means formed thereon for interlocking engagement with the screw thread, and means for shifting the reciprocable control member perpendicularly to its axis to effect its selective engagement and disengagement from the reactance member, said members being shiftable between engaged and disengaged positions by a movement no greater than the depth of said screw thread.

12. A control mechanism comprising a frame, said frame being formed with an elongated tube-like portion, a control member reciprocably mounted with respect to the frame and within said tube-like portion, a flexible coil sheath fixed at one end to said frame tube-like portion, a control cable shiftable within the sheath and fixed at one end to said control member, a reactance member fixed to the frame, said control member being elongated and being provided with a longitudinally extending screw thread and said reactance member having means formed thereon for interlocking engagement with the screw thread, and means for shifting said control member substantially perpendicularly to the axis of said screw thread to effect its selective engagement with and disengagement from the reactance member, at least one of said members at the point of initial engagement therebetween being rounded to facilitate relative sliding movement between the members.

13. A control mechanism comprising a housing, said housing being provided with a bore extending therethrough, an elongated control member arranged within said bore, said control member being of general cylindrical shape and being provided with a longitudinally extending screw thread, a second cylindrical bore in said housing disposed substantially perpendicularly to the first bore, a stud-like reactance member arranged within said second bore in adjustable screw threaded engagement therewith, said reactance member being provided with a projection adapted for interlocking engagement with the screw thread of the control member, means for locking said reactance member in adjusted position, means for bodily shifting said control member to effect its selective engagement with and disengagement from the reactance member, and a third bore arranged in the housing also substantially perpendicularly disposed in reference to the first housing bore, and a compression spring arranged in the third bore and adapted to urge the control member into engagement with the stud-like reactance member.

14. A control mechanism comprising a housing, said housing being provided with a bore extending therethrough, an elongated control member arranged within said bore, said control member being of general cylindrical shape and being pro-

vided with a longitudinally extending screw thread, a second cylindrical bore in said housing disposed substantially perpendicularly to the first bore, a stud-like reactance member arranged within said second bore, said reactance member being provided with a projection adapted for interlocking engagement with the screw thread of the control member, means for bodily shifting said control member to effect its selective engagement with and disengagement from the reactance member, and a third bore arranged in the housing also substantially perpendicularly disposed in reference to the first housing bore, a compression spring arranged in the third bore and adapted to urge the control member into engagement with the stud-like reactance member, and a plug member having screw threaded engagement with said third housing bore and operable to adjust the tension of said spring.

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