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ACTUATING DEVICE

Filed Jan. 18, 1966

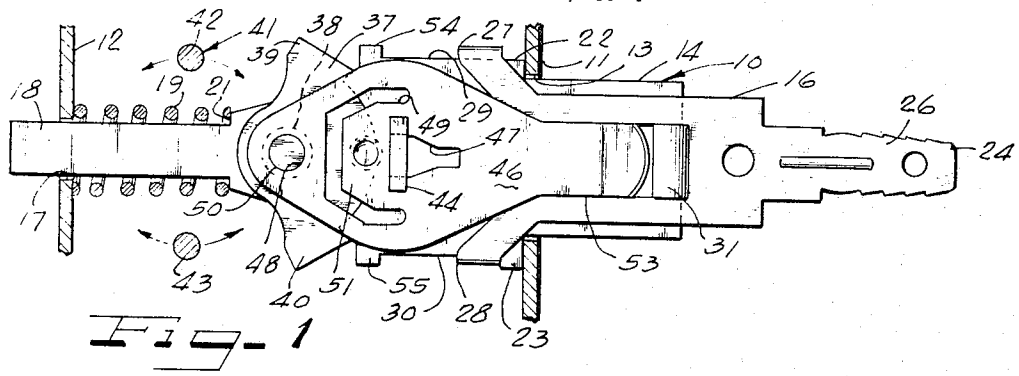


Fig. 1

Fig. 2

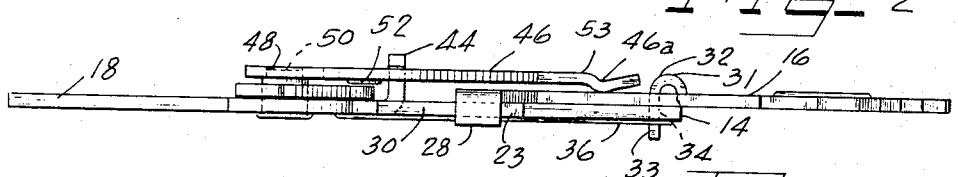


Fig. 3

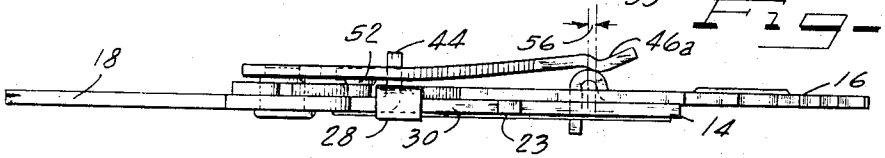
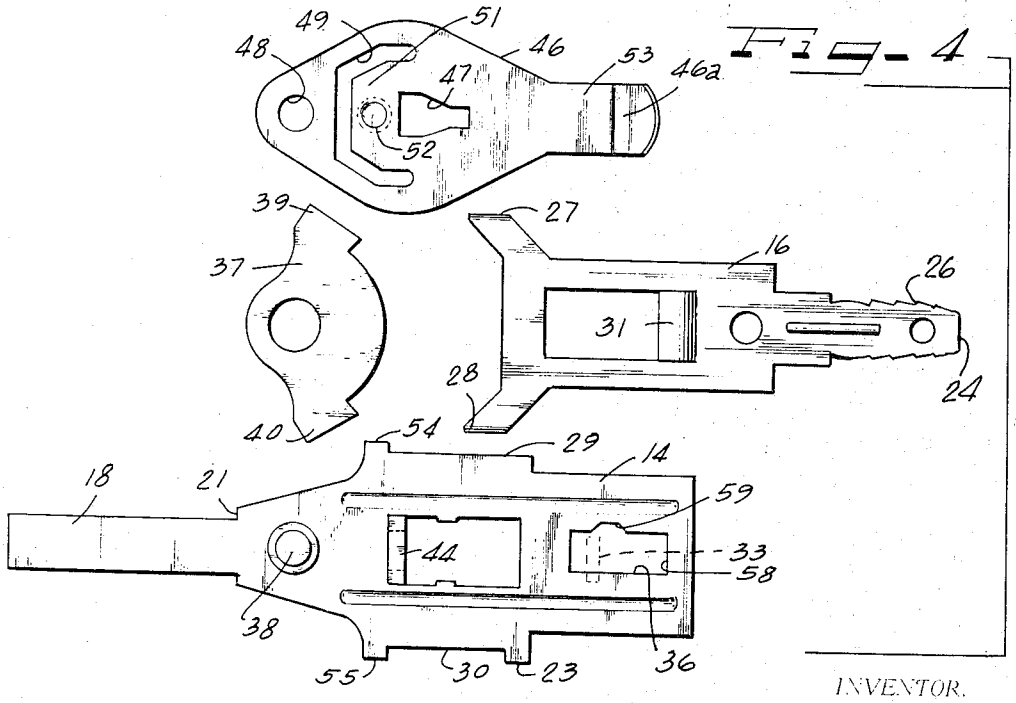


Fig. 4



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ACTUATING DEVICE

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This invention relates generally to resettable actuating devices, and more particularly to resettable actuating devices for use with push-button tuners on radios.

Although this invention may find a variety of uses, it has particular utility when used in conjunction with push-button automobile radios, and therefore is described in connection therewith. Many tuners of automobile radios are provided with a plurality of tuning slugs which are ganged together by a common movable bar. The movable bar is pivotally connected to a rotatable shaft so that when the shaft turns in either direction about its axis the bar is moved in substantially a straight line in one of two directions in accordance with the direction of rotation of the shaft. This causes the tuning slugs connected to the rod to be moved progressively into or out of engagement with their respective tuning coils.

The rotatable shaft comprises a pair of rods which are secured in parallel spaced relation one to the other and these parallel rods are rotated about an axis intermediate thereof.

When one of the push buttons of an automobile radio is manually depressed, a cam associated with the actuating device engages one or the other of the two rods and rotates the shaft formed thereby to move the bar connected thereto and position the tuning slugs so that the radio will receive a particular preselected radio station.

When it is desired to change the particular radio station which is selected by pressing a particular push button on the radio, the cam on the actuating device must be released from its present position and reset to a new position in accordance with the newly selected radio station. In automobile radios it is desirable that the cam of each actuating device be released by tension as the push button is pulled outwardly from its neutral position. Furthermore, it is desirable that the amount of tension required to release the cam of each actuating device be as near as possible to the same value.

Upon manually selecting a different radio station, the movable bar is positioned to a particular point within its movable range. This causes the rotatable shaft to turn about its axis and be positioned to a particular point within its rotatable range. After a different radio station has been selected, the push button of the radio is pressed inwardly thereby applying pressure to the actuating device. This action causes the cam, which has been previously released, to engage and sense the position of two parallel rods which make up the shaft. Additional pressure is then applied to the actuating device to cause the cam to be locked in place in accordance with the sensed position of the engaged rods. The pressure required to lock the cam in place must be sufficiently high so that the cam will not move from its locked position during the normal operation of the push buttons on the automobile radio. However, the pressure required to lock the cam into position must also be sufficiently low so as not to cause detuning of the tuning slugs by excessive pressure applied to the shaft as the cam is being locked into position. It can be seen therefore that the pressure required to lock the cam in place falls within a relatively narrow range of pressures.

Heretofore, resettable actuating devices used with push-button tuners have been relatively complex requiring many components parts for their proper operation. Furthermore, after such locking devices have been assembled,

it may be necessary to place each individual locking device on a test bench and manually operate the device a number of times to insure that the release tension and the locking pressure fall within the prescribed limits. The test operation causes the movable parts of the actuating device to break in so that this required range of operating tensions and pressures is obtained. It can be appreciated that the operation of manual break-in is costly in two respects. Firstly, that each individual actuating device must be handled by a person who manually operates the actuating device until its locking pressure and release tension fall within the prescribed limits. Secondly, there is the problem of discarding actuating devices which do not meet the required specifications even after the break in period.

Therefore, one of the primary objects of the present invention, particularly from a manufacturing standpoint, is to provide a resettable actuating device which can be mass produced so that each individual actuating device acquires substantially the same locking pressure and each individual locking device acquires substantially the same release tension, thereby obviating the need for manual break in.

Another object of the present invention is to provide releasable actuating devices which have a minimum number of components and which components are easily and quickly assembled.

Still another object of the present invention is to provide a resettable actuating device for use with a push-button tuner of an automobile radio such that the push button can be pulled outwardly to release the sensing cam of the actuating device, thereby allowing manual selection of the tuner to receive a radio station, and thereafter the push button is pressed inwardly to sense the condition of the tuner and lock the sensing cam in accordance with the sensed condition.

On the drawings:

FIGURE 1 shows a side elevational view of an actuating device which is constructed in accordance with the principles of this invention;

FIGURE 2 is a top elevational view of the actuating device of FIGURE 1 and shows the condition of the actuating device when the sensing cam is released;

FIGURE 3 is a top elevational view of the actuating device of FIGURE 1 and shows the actuating device in condition when the sensing cam is locked in position; and

FIGURE 4 is an expanded view of each component part of the actuating device.

As shown on the drawings:

As seen in FIGURE 1, a portion of an actuating device **10** is positioned between opposing end walls **11** and **12** of a radio tuner housing. The forward end wall **11** has an aperture **13** for receiving a main slide member **14** and an extended slide member **16** of the actuating device **10**, the slide member **16** being movable in sliding relation to the slide member **14**. Also, the rear wall **12** has an aperture **17** for receiving a dimensionally reduced end portion **18** of the main slide **14**. A spring **19** is positioned about the end portion **18** of the main slide **14** and extends between the rear wall **12** and a flange **21** formed integrally with the main slide **14**. Therefore, the spring **18** urges the main slide **14** toward the forward wall **11**. Movement of the main slide **14** in the direction of the wall **11** is limited by flanges **22** and **23** which are formed as part of the main slide **14** and extend beyond the opposing sides of the aperture **13** to engage the surface of the wall **11**.

An end portion **24** of the extended slide **16** is provided with serrations **26** for receiving a push button. A pair of guide flanges **27** and **28** are formed integrally with the extension slide **16** and slidably engage a pair of rails **29**

and 30 respectively which, in turn, are formed as part of the main slide 14.

The extension slide 16 has formed thereon a protuberance 31. As seen in FIGURES 2 and 3, the protuberance 31 consists of an arcuate portion 32 which terminates in a straight portion 33 generally perpendicular to the plane of the slide 16. The straight portion 33 extends through a slot 58 formed in the slide 14 (FIGURE 4). Furthermore, the straight portion 33 is notched in the region indicated by reference numeral 34 for slidable engagement with a rail 36 formed on the main slide 14, as best seen in FIGURE 4. The guide flanges 27 and 28 which are in slidable contact with the rails 29 and 30, together with the notch 34 which is in slidable contact with the rail 36, serves to maintain the slidable relationship between the main slide 14 and the extended slide 16 confined to a fixed linear path.

A cam 37 is pivotally mounted on a pin 38 which, in turn, is fixedly secured to the main slide 14. The cam has a pair of lobes 39 and 40 which engage a rotatable assembly 41 when the actuating device 10 is pressed inwardly. The assembly 41 is made up of two parallel rods 42 and 43 which are connected at the ends thereof. The rods 42 and 43 are rotatable about an axis which is intermediate the rods and substantially parallel therewith. Therefore, when the assembly 41 is rotated in one direction, the rods 42 and 43 move in the direction indicated by the solid arrowed line, and when the assembly 41 is rotated in the opposite direction, the rods 42 and 43 move in the direction indicated by the dotted arrowed line.

The actuating device 10, as shown in FIGURES 1 and 2, is in the released condition, and the cam 37 is free to pivot about the pin 38. However, the range of pivotal movement of the cam 37 is limited by the lobes 39 and 40 which alternately engage a tab 44. The tab 44 is part of the main slide 14 and is struck out therefrom as seen in FIGURES 2 and 3. Therefore, the cam 37 is maintained within a range of positions so that either the lobe 39 or the lobe 40 can sense the position of the rods 42 or 43 respectively, regardless of their position within the rotatable arc of the assembly 41.

A spring 46 is provided with a plurality of apertures 47, 48 and 49, as best seen in FIGURE 4. The spring 46 is held in position over the extension slide 16 and the cam 37 by a reduced diameter portion 50 of the pin 38, which engages the aperture 48, and by the upper end of the tab 44 which extends through the aperture 47. Also, the tab 44 has an enlarged head portion which extends beyond the width of the aperture 47 to abut against the top surface of the spring 46 as seen in FIGURES 2 and 3, to thereby lock the spring 46 to the slide 14.

The aperture 49 is substantially C-shaped and thereby provides a centrally disposed gripping portion 51. When the actuating device 10 is in the locked position, as shown in FIGURE 3, the gripping portion 51 is urged against the cam 37. This action causes the cam 37 to be locked in a fixed position on the main slide 14. To facilitate the gripping action of the gripping portion 51, a detent 52 is formed thereon to engage the cam 37.

The spring 46 is provided with an extended end portion 53. The end of the extended portion 53 is preferably arcuately shaped and crimped as at 46a so as to be releasably lockable with the protuberance 31 on the main slide 14. The spring 46 is preferably made from SAE 1095 steel and may be approximately 0.040 inch thick. Also, it is preferable that the spring 46 has a spring temper of Rockwell "C" 50–52. These parameters provide a spring which is substantially rigid yet yieldable within the small range necessary to lock the cam 37 in position.

When the extension slide 16 is pressed inwardly, by pressure applied to the push button, the protuberance 31 engages the extended portion 53 of the spring 46. With sufficient pressure applied to the extension slide 16, the protuberance will cause the spring 46 to be flexed slightly along the tab 44 as a fulcrum. Since the opposite end of the spring 46 is held against movement by the shoulder formed on the pin 50, the gripping portion 51, namely the detent 52, is urged against the cam 37. The pressure per unit area exerted on the cam 37 is relatively high since the entire force of the spring 46 is applied to the cam through the small area of the detent 52. Therefore, the cam 37 will not be moved inadvertently when engaging the rods 42 and 43 to rotate the shaft 41.

To limit the movement of the extension slide 16 in the direction of the cam 37, a pair of bosses 54 and 55 are formed on the main slide 14. Therefore, the guide flanges 27 and 28 abut against the bosses 54 and 55 respectively, to stop the travel of the extension slide 16.

As seen in FIGURE 4, the rail 36 is formed by one of the side walls of the aperture 58. To facilitate assembly of the actuating device 10, a portion of the aperture 58 is notched so that the width of the aperture is slightly greater than the width of the straight portion 33. This allows the straight portion 33 to fit into the aperture 58 while the guide flanges 27 and 28 are in position on their respective rails.

When the actuating device 10 is in the locked position, as seen in FIGURE 3, the center of the protuberance 31 extends slightly beyond the arcuate portion formed near the end of the spring 46. This feature maintains the extension slide 16 in the locked position until sufficient tension is applied to the extension slide 16 to disengage the protuberance 31 from the spring 46. The relationship between the amount to which the center of the protuberance extends beyond the center of the arcuate portion, which is indicated by reference numeral 56, as well as the resiliency of the spring 46, serve to control the amount of tension necessary to pull the extension slide outwardly and release the cam 37. On the other hand, the relationship between the distance to which the protuberance 31 flexes the end of the spring 46, the resiliency of the spring 46, and the configuration of the gripping portion 51, serve to control the pressure necessary to move the extension slide inwardly and lock the cam 37. Therefore, the range of locking pressures and release tensions is controlled by a minimum number of parameters, and each of the parameters can be maintained within a desired limit.

In summary, the present invention has provided an actuating device for use with radio tuners. The slidable relation between the main slide 14 and the extension slide 16 is maintained in a fixed path by guide flanges 27 and 28 which engage rails 29 and 30 respectively, and by the notch 34 which engages the rail 36. The spring 46 is provided with a gripping portion between the apertures 47 and 48. When the actuating device is in the locked position, the protuberance 31 engages the spring 46 and causes the gripping portion 51 to be urged against the cam 37 and lock the cam in place.

It can be seen therefore, that the present invention provides a resettable actuating device which has a minimum number of relatively inexpensive component parts. Furthermore, the locking pressure and release tension of the actuating device are controlled by a minimum of controllable parameters, thereby obviating the need for manual break in.

It will be understood that variations and modifications may be effected without departing from the spirit and scope of the novel concepts of this invention.

What is claimed is:

1. A resettable actuating device for initially sensing a particular position of a movable element and thereafter moving the element back to the particular position when displaced therefrom by actuation of said actuating device, including:

a main slide member;

an extension slide member mounted on said main slide member for slidable movement relative thereto;

a cam pivotally connected to said main slide member for engagement with the element to be moved;

a substantially stiff spring having an extended portion

formed at one end thereof and further having a gripping portion, said spring being mounted on said main slide member, said spring including a C-shaped aperture defining said gripping portion; and

a protuberance carried by said extension slide for selectively engaging the extended portion of said spring, whereby when said protuberance is in engagement with the extended portion of said spring, the gripping portion of said spring is urged against said cam for holding the cam in a fixed position.

2. An actuating device for a radio tuner comprising:

a first slide member;

a second slide member slidably mounted with respect to said first slide member;

means confining the sliding movement between said first and second slide members to a linear path;

a cam;

a pin extending from said first slide member and pivotally mounting said cam for limited rotary movement thereabout;

a relatively stiff spring member having one end embracing said pin and overlying said cam;

means on said first slide member holding said spring member against said second slide member and providing a fulcrum for flexing of said spring member;

means on said spring member intermediate said fulcrum and said pin providing a pressure applying area of relatively limited extent on said cam upon flexure of said spring member, said spring member including a C-shaped aperture defining said pressure applying area; and

releasable locking means between said spring element and said second slide member providing for flexure of said spring element about said fulcrum upon relative sliding movement between said first and second slide members.

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