July 20, 1965 A. J. CLARK 3,195,359

PUSHBUTTON STRUCTURE

Filed Dec. 21, 1961 2 Sheets-Sheet 1

FIG. 1

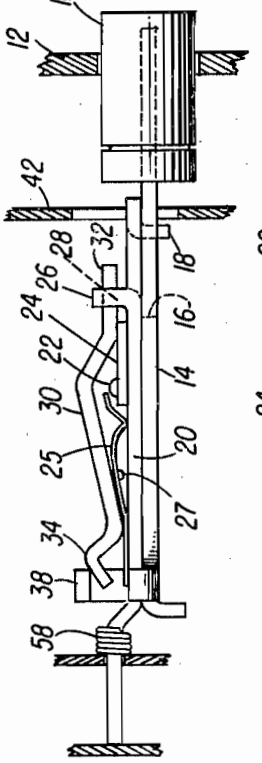


FIG. 2

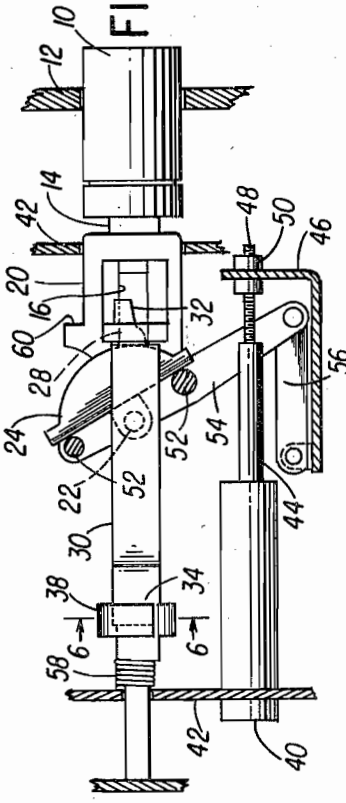


FIG. 3

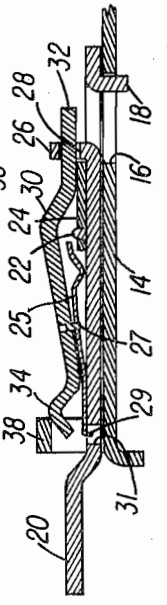


FIG. 4

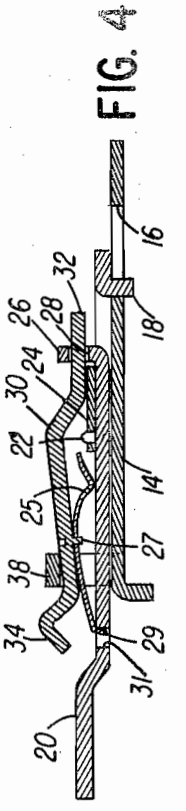


FIG. 5

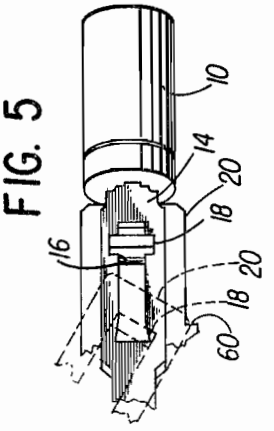
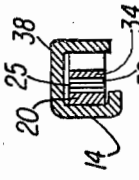


FIG. 6



INVENTOR.
ALFRED J. CLARK

BY Mueller & Nichols

ATTYS.

July 20, 1965 A. J. CLARK 3,195,359

PUSHBUTTON STRUCTURE

Filed Dec. 21, 1961 2 Sheets-Sheet 2

FIG. 7

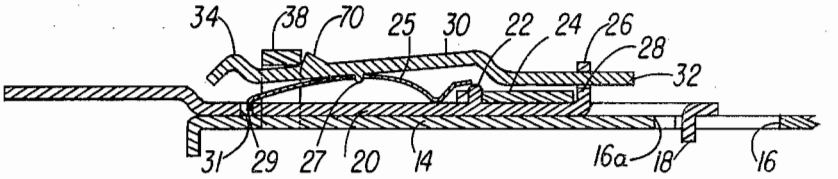


FIG. 8

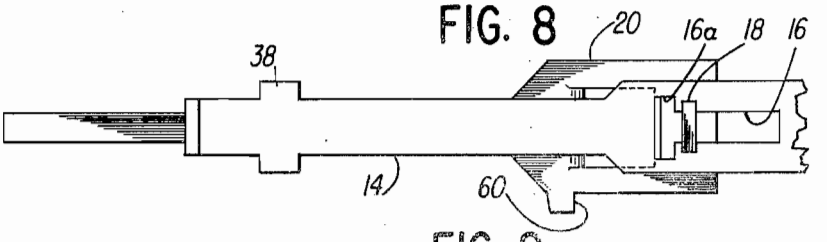


FIG. 9

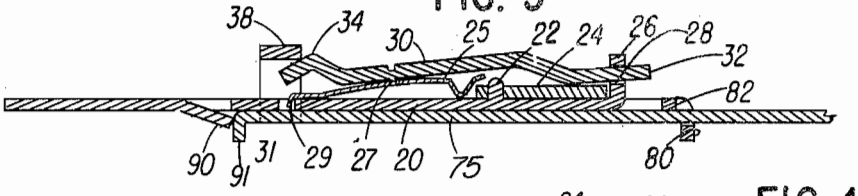


FIG. 10

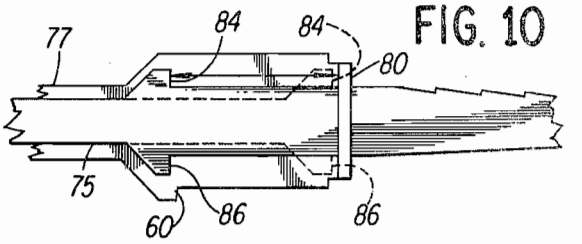
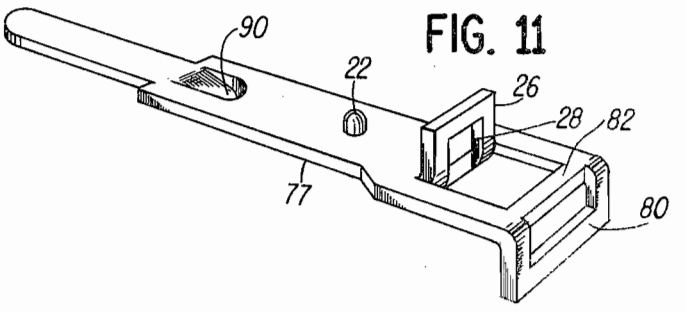


FIG. 11



INVENTOR.
ALFRED J. CLARK

BY Mueller & Aichele

ATTYS.

United States Patent Office 3,195,359 Patented July 20, 1965

3,195,359

PUSHBUTTON STRUCTURE

Alfred J. Clark, Palatine, Ill., assignor to Motorola, Inc., Chicago, Ill., a corporation of Illinois

Filed Dec. 21, 1961, Ser. No. 161,162
4 Claims. (Cl. 74—10.33)

This invention relates to pushbutton tuning mechanism for radio receivers and more particularly to an improved locking device for use in presetting an adjustable pushbutton structure to permit repeated selection of a given station.

In radio tuners it is common to provide an adjustable cam member supported on a slidably mounted plunger rod. The cam member engages a treadle bar structure, including a pair of parallel members mounted on a rotatable carriage, coupled to tuning elements associated with a resonant circuit. In such mechanisms the cam member is fixed at a certain angle with respect to its supporting plunger rod so that as the rod is moved with respect to the parallel members, the cam member engages the parallel treadle bar members and brings them into alignment with the surface of the cam member. This sets the carriage and the resonant circuit to the proper adjustment for reception of a particular station.

Devices of this type which have heretofore been available have the disadvantage in that they require a large number of components. Furthermore, their construction has required securing the various components together by means of rivets resulting in relatively high labor costs due to the assembly time required for these operaitons.

It is an object of this invention to provide a locking device for use in presettable pushbutton mechanisms which is reliable of operation and contains only a few parts.

Another object of the invention is to provide a locking device for use in presettable pushbutton tuning mechanisms which is low in cost and lends itself to automation.

A further object of the invention is to provide a locking device for use in presettable pushbutton tuning mechanisms which is capable of rapid assembly without tools.

A feature of the invention is the provision, in a pushbutton plunger system, of a plunger rod havnig a T lug thereon and an actuating bar with a corresponding guide slot therein, whereby the plunger rod and actuating bar are held in relatively slidable assembled relation.

Another feature of the invention is the provision of a pushbutton plunger system having a cam member adapted to be locked between a plunger rod and a locking lever, wherein a pivot post on a flat surface of the plunger rod cooperates with an opening in the cam member for removably mounting the cam member on the plunger rod, and the locking lever holds the cam member on the pivot post and locks the same in a fixed position.

Another feature of the invention is the provision, in a pushbutton plunger system having a plunger rod and a locking lever, of a slidable actuating member having an integral locking portion thereon in the shape of a hook which engages the locking lever and which is shaped to permit easy assembly of the system by insertion of the plunger rod and locking lever into the hook shaped locking portion through the open side thereof.

In the drawing:

FIG. 1 is a plan view of the pushbutton plunger assembly of the invention in locked position;

FIG. 2 is a side elevation thereof;

FIG. 3 is a half section thereof;

FIG. 4 is a half section thereof in unlocked position;

FIG. 5 is a perspective view of the T lug and slot of the pushbutton plunger assembly with a partially disassembled assembly shown in phantom;

FIG. 6 is a section view taken along line 6—6 of FIG. 2;

FIG. 7 is a half section of a second embodiment of the invention;

FIG. 8 is a plan view thereof;

FIG. 9 is a half section of a third embodiment of the invention;

FIG. 10 is a partial plan view thereof; and

FIG. 11 is a perspective view of a part of the third embodiment.

The invention provides a mechanism for locking and releasing a cam member on a plunger rod in a pushbutton control mechanism such as the tuning apparatus for a radtio receiver. The plunger assembly is of the "push-to-lock" type. A slidable actuating bar is operable by the pushbutton. The plunger rod is slidably and removably attached to the actuating bar for rapid assembly.

A cam member is rotatably held by a projection on the plunger rod. A resilient locking lever has one end fixed relative to the plunger rod, adjacent the cam member, and its other end free. The surface of the lever is spaced from the side of the plunger rod so that the cam member is positioned between the plunger rod and the lever and held on the projection by the lever. A raised or arcuate portion of the resilient lever adjacent its free end is engaged by a hook shaped slidable locking portion of the actuating bar to move the raised portion of the lever toward the plunger rod thus causing the lever to apply pressure on the cam member to lock its rotation. The cam member is unlocked by sliding the locking portion out of engagement with the raised portion of the locking lever. A spring member positioned between the locking lever and the plunger rod holds the locking lever against the locking portion to release pressure on the cam member to unlock it. The slidable locking portion is hooked shaped to permit insertion of the tongue and plunger rod through the open side during assembly. After the assembly has been set with the cam member in a locked position, inward movement of the pushbutton causes movement of the slidably mounted plunger rod and actuation of the tuning treadle of the mechanism to the angular position of the cam member.

Referring to FIG. 1, pushbutton **10** is shown protruding partially through the face plate of a radio receiver, a portion of which is represented at **12**. Slidable actuating bar **14** is fixed to and operable by pushbutton **10**. The actuating bar **14** in turn operates plunger rod **20** which controls the tuning mechanism of the radio receiver. As may be seen more clearly in FIG. 5, actuating bar **14** has a guide slot **16** formed therein. T lug **18**, which is part of plunger rod **20**, is removably fitted into guide slot **16** and is slidable therein.

Plunger rod **20** has a projecting pivot portion **22** extending from one side. Cam member **24**, which is of generally semicircular shape, has an opening for receiving pivot portion **22** to provide a pivot mounting of the cam member **24** with respect to rod **20**. Plunger rod **20** has a flanged portion **26** having a key slot **28** therein extending on the opposite side from T lug **18**. A resilient locking lever **30** has on one end a locking key portion **32** which is insertable in key slot **28**. Locking lever **30** is disposed along the length of plunger rod **20** in a direction away from push-button **10** and spaced from plunger rod **20** to permit positioning of cam member **24** between the plunger rod and the lever. Cam member **24** is thereby held on pivot portion **22** by lever **30**. Placed between locking lever **30** and plunger rod **20**, to bias the two apart, is leaf spring **25**. Spring **25** is positioned by means of an extruded locating pin **27** on locking lever **30**, and by a locating tab **29** on the spring fitting in locating slot **31** on plunger rod **20**. (See FIGS. 3 and 4.)

At the opposite end of locking lever 30 is an arcuate or raised portion 34. When raised portion 34 is moved relatively close to plunger rod 20, the opposite end of locking lever 30 will apply pressure to wedge cam 24 against plunger rod 20, effectively locking rotation of cam member 24. To hold raised portion 34 relatively close to plunger rod 20, actuating bar 14 is provided with a hook-shaped integral locking portion 38 fashioned therefrom. Locking portion 38 encloses plunger rod 20 and locking lever 30 leaving an opening on one side, the advantage of which is explained at a later point in this specification.

There is shown in FIG. 2 one of a plurality of slug tuned coil units 40 which are supported by the chassis of the tuner represented at 42. The units 40 may be part of resonant circuits in a radio receiver as are known to those in the art. The movable slugs 44 of the units 40 are fastened to a slidable portion of carriage 46 by means of screw rod 48 and threaded anchor 50. Carriage 46 also includes a treadle structure comprising a pair of parallel bar members 52 mounted on an arm 54 rotatable about an axis midway between the bar members. Link section 56 connects the slidable portion of carriage 46 to an extension of the arm 54 so that as bars 52 are rotated about their axis, carriage 46 and slugs 44 attached thereto are moved to effect continuous tuning of the coil units 40.

To fix the cam member 24 at a desired angular position, for pushbutton operation of the tuning apparatus, the carriage 46 is first adjusted by suitable manual tuning means to a desired setting with the bars 52 in a position characteristic of that setting. The cam member 24 is then unlocked by drawing pushbutton 10 outwardly from the face plate of the receiver 12 thereby drawing with it actuating bar 14. It should be noted that in normal position spring 58 will cause pushbutton 10 to protrude further from receiver face plate 12 than is indicated in FIG. 2, by biasing butt portion 60 of plunger rod 20 against the chassis 42. Plunger rod 20 and hence locking lever 30 will remain fixed due to butt portion 60 engaging chassis 42. The results of this operation are particularly illustrated in FIGS. 3 and 4. FIG. 3 shows the device in a locked position with locking portion 38 holding raised portion 34 relatively close to plunger rod 20. Upon withdrawing actuating bar 14 which slides on T lug 18 in guide slot 16, the device assumes the position of FIG. 4. Locking portion 38 has been moved from raised portion 34, allowing raised portion 34 to be biased away from plunger rod 20 by spring 25. Since the pressure of locking lever 30 is now released from cam member 24, cam member 24 is freely rotatable on pivot portion 22.

In order to lock the cam member 24, actuating bar 14 is moved to the position shown in FIG. 3 by depression of pushbutton 10. In this position, the locking portion 38 constrains the raised portion 34 of the lever 30, moving the raised portion toward plunger rod 20 causing the lever to flex at its fixed end providing a lever effect, a substantial clamping force on cam member 24. In this way the cam member can be locked easily by depression of the pushbutton 10. The action of T lug 18 butting against the end of guide slot 19 governs the extent of the relative movement of actuating bar 14 to plunger rod 20.

Returning to FIG. 2, it may be seen that when pushbutton 10 is depressed sufficiently to cause locking of cam member 24, the cam member is also positioned at the same angle as parallel bar members 52. Thus, when bias spring 58 returns the pushbutton to the normal position, that is with butt portion 60 of plunger rod 20 butted against chassis 42, slug 44 may be returned to the preset position merely by depressing pushbutton 10 and hence the entire assembly against spring 58 causing cam member 24 to bring parallel bars 52 into alignment with the surface thereof.

Since there are relatively few parts, and no rivets in the device, its assembly is simple. Cam member 24 and leaf spring 25 are placed on plunger rod 20 in proper position, the cam member fitting on pivot portion 22, and the spring held by tab 29 and pin 27. Locking key 32 of resilient locking lever 30 is then inserted into locking key slot 28 of flange portion 26 on plunger rod 20, locking lever 30 being disposed along the length of plunger rod 20. Lever 30 thereby holds cam member 24 and leaf spring 25 in their respective positions. T lug 18 is then inserted in guide slot 16 of slidable actuating bar 14. Plunger rod 20 and locking lever 30 are pressed together against the bias of spring 25 and pivoted into hook shaped locking portion 38 through the opening therein. Actuating bar 14 is then moved to bring locking portion 38 into engagement with raised portion 34 of lever 30, locking cam member 24 in position. The assembly is now complete and ready for insertion into the radio receiver.

FIGS. 7 and 8 depict a second embodiment of the invention. Guide slot 16 in actuating bar 14 has a widened portion 16*a* at one end thereof. The provision of widened portion 16*a* in slot 16 permits entry of T lug 18 into slot 16 without the necessity of turning plunger rod 20 at approximately right angles to actuating bar 14, T lug 18 after assembly, is prevented from traveling far enough to align itself with widened portion 16*a* by means of stop lug 70 on locking lever 30. When the device is unlocked, stop lug 70 will engage locking portion 38 to limit movement of plunger rod 20. This eliminates the possibility of T lug 18 slipping out of slot 16 through widened portion 16*a* due to vibration of the device. If removal does become necessary after the device has been assembled, raised portion 34 need only be pressed toward plunger rod 20 allowing stop lug 70 to slip under locking portion 38.

FIGS. 9, 10 and 11 show a third embodiment of the invention. The slot 16 in actuating bar 14 of the previous two embodiments has been eliminated in actuating bar 75. Instead of a T lug 18, as in the prior embodiments, plunger rod 77 is provided with an L portion 80 at one end thereof. An opening 82 is provided in L portion 80 to permit passage therethrough of actuating bar 75. Thus, in this embodiment, actuating bar 75 slides freely in opening 82 necessitating the provision of limitations on the linear movement of actuating bar 75 in order to properly position locking portion 38 in locked and unlocked positions. To accomplish this, plunger rod 77 is provided with a punched out stop portion 90 thereon, which engages a flanged portion 91 of actuating bar 75 when the device is in locked position. Linear movement of actuating bar 75 in unlocked position is limited by shoulders 84, 86, provided on the sides of actuating bar 75, which engages L portion 80 of plunger rod 77. This is depicted in the dotted position of FIG. 10.

Assembly of this embodiment is accomplished after placement of cam member 24, spring 25, and lever 30 as are the prior embodiments, merely by inserting the end of actuating bar 75 in opening 82 and continuing to push therein until flanged portion 91 slips behind stop portion 90.

The invention provides, therefore, a locking mechanism for locking a cam member on a pushbutton plunger rod in a desired angular position, which locking mechanism contains few component parts and is therefore relatively simple and inexpensive to manufacture. Furthermore, the need for rivets is dispensed with, allowing rapid assembly without tools and lending itself to automation.

I claim:

1. A pushbutton slide mechanism for use in presentable pushbutton tuners including in combination, a pushbutton operated slidable actuating bar having a guide slot therein, a plunger rod having an opening therein and further having a T lug thereon slidable in said guide slot and removable therefrom, said plunger rod further having a projection pivot post having a free end, a cam member disposed against said plunger rod and having an opening therein removably mating with said pivot post,

a resilient elongated locking lever having an end removably mating with said opening in said plunger rod and being adapted to hold said cam member against said plunger rod, said actuating bar having a locking portion adapted to move said lever with respect to said plunger rod upon movement of said actuating bar relative to said plunger rod to cause said locking lever to exert a clamping force on said cam member and hold said cam member in fixed position with respect to said plunger rod, said locking portion being generally hooked shaped to permit placement of said plunger rod and said lever therein through the opening side thereof, and spring means positioned between said plunger rod and said locking lever to bias said plunger rod against said actuating bar and said locking lever against said locking portion.

2. A rivetless pushbutton slide mechanism for use in presentable pushbutton tuners for radio receivers, said slide mechanism including in combination, a pushbutton operated slidable actuating bar having a guide slot therein, a plunger rod having a T lug thereon slidable in said guide slot and removable therefrom, said plunger rod further having a locating slot and a projecting pivot post having a free end, a cam member disposed against said plunger rod and having an opening therein removably mating with said pivot post and adapted for positioning a tuning apparatus, a locking lever one end of which has a raised portion, means on said plunger rod engaging the other end of said locking lever and releasably holding the same for pivotal movement with respect to said plunger rod, said locking lever being adapted to hold said cam member against said plunger rod and further adapted when said raised portion is positioned relatively close to said plunger rod to lock said cam member against rotation by applying pressure thereon, said actuating bar having a hook shaped integral locking portion shaped to permit placement of said plunger rod and said locking lever therein through the open side thereof, an extruded locating projection on said locking lever, a leaf spring having a locating opening and a locating tab portion, said spring being positioned between said plunger rod and said locking lever and positioned by engagement between said locating projection and said locating opening, and by engagement between said locating tab portion and said locating slot in said plunger rod, said spring serving to bias said plunger rod against said actuating bar and to bias said locking lever against said locking portion, whereby movement of said slidable actuating bar such that said locking portion thereof engages said raised portion of said lever causes movement of said lever into engagement with said cam member to lock the same against rotation.

3. A presettable pushbutton slide mechanism including in combination, a slidable actuating bar and a plunger rod having mutually engageable means removably holding said actuating bar and said plunger rod in slidable relationship, said mutually engageable means being disengageable when said plunger rod is pivotal with respect to said actuating bar, said plunger rod further having an opening therein and further having a pivot post projecting therefrom with a free end, a cam member disposed against said plunger rod and having an opening therein removably receiving said pivot post, an elongated locking lever having an end removably held in said opening in said plunger rod and being adapted to hold said cam member against said plunger rod, said actuating bar having an integral hook shaped locking portion adapted to move said lever with respect to said plunger rod upon movement of said actuating bar relative to said plunger rod to cause said locking lever to exert frictional force on said cam member and hold said cam member in fixed position with respect to said plunger rod, said hook shaped locking portion having an open side to receive said plunger rod and said lever therethrough when said plunger rod and said locking lever are pivoted with respect to said actuating bar to facilitate assembly and disassembly.

4. A presettable pushbutton slide mechanism including in combination, a slidable actuating bar and a plunger rod having mutually engageable means removably holding said actuating bar and said plunger rod in slidable relationship, said mutually engageable means being disengageable when said plunger rod is pivoted with respect to said actuating bar, said plunger rod further having an outwardly projecting portion having a slot therein, a pivot post with a free end projecting from said plunger rod, a cam member disposed against said plunger rod and having an opening therein removably receiving said pivot post, an elongated locking lever having a notched end removably captured in said slot in said outwardly extending portion of said plunger rod and being adapted to hold said cam member against said plunger rod, said actuating bar having an integral hook shaped locking portion adapted to move said lever toward said plunger rod upon movement of said actuating bar relative to said plunger rod to cause said locking lever to exert frictional force on said cam member to hold said cam member in fixed position with respect to said plunger rod, resilient means biasing said locking lever against said locking portion, said hook shaped locking portion having an open side permitting movement of said plunger rod and said locking lever therethrough as said plunger rod is pivoted with respect to said actuating bar, whereby said slide mechanism may be assembled and disassembled respectively by pivoting said plunger rod and said locking lever into and out of said locking portion.

References Cited by the Examiner

UNITED STATES PATENTS

2,266,711	12/41	Crosby et al.	74—10.33
2,301,090	11/42	Teaf	74—10.33
2,489,544	11/49	Schwarz et al.	74—10.33
2,659,236	11/53	Allen	74—10.33
2,793,531	5/57	Thompson	74—10.33
2,800,027	7/57	Schwarz	74—10.33
2,930,241	3/60	Roback	74—10.33
3,086,401	4/63	Horton	74—10.33

FOREIGN PATENTS

742,939	1/56	Great Britain.

BROUGHTON G. DURHAM, *Primary Examiner.*

a resilient elongated locking lever having an end removably mating with said opening in said plunger rod and being adapted to hold said cam member against said plunger rod, said actuating bar having a locking portion adapted to move said lever with respect to said plunger rod upon movement of said actuating bar relative to said plunger rod to cause said locking lever to exert a clamping force on said cam member and hold said cam member in fixed position with respect to said plunger rod, said locking portion being generally hooked shaped to permit placement of said plunger rod and said lever therein through the opening side thereof, and spring means positioned between said plunger rod and said locking lever to bias said plunger rod against said actuating bar and said locking lever against said locking portion.

2. A rivetless pushbutton slide mechanism for use in presentable pushbutton tuners for radio receivers, said slide mechanism including in combination, a pushbutton operated slidable actuating bar having a guide slot therein, a plunger rod having a T lug thereon slidable in said guide slot and removable therefrom, said plunger rod further having a locating slot and a projecting pivot post having a free end, a cam member disposed against said plunger rod and having an opening therein removably mating with said pivot post and adapted for positioning a tuning apparatus, a locking lever one end of which has a raised portion, means on said plunger rod engaging the other end of said locking lever and releasably holding the same for pivotal movement with respect to said plunger rod, said locking lever being adapted to hold said cam member against said plunger rod and further adapted when said raised portion is positioned relatively close to said plunger rod to lock said cam member against rotation by applying pressure thereon, said actuating bar having a hook shaped integral locking portion shaped to permit placement of said plunger rod and said locking lever therein through the open side thereof, an extruded locating projection on said locking lever, a leaf spring having a locating opening and a locating tab portion, said spring being positioned between said plunger rod and said locking lever and positioned by engagement between said locating projection and said locating opening, and by engagement between said locating tab portion and said locating slot in said plunger rod, said spring serving to bias said plunger rod against said actuating bar and to bias said locking lever against said locking portion, whereby movement of said slidable actuating bar such that said locking portion thereof engages said raised portion of said lever causes movement of said lever into engagement with said cam member to lock the same against rotation.

3. A presettable pushbutton slide mechanism including in combination, a slidable actuating bar and a plunger rod having mutually engageable means removably holding said actuating bar and said plunger rod in slidable relationship, said mutually engageable means being disengageable when said plunger rod is pivotal with respect to said actuating bar, said plunger rod further having an opening therein and further having a pivot post projecting therefrom with a free end, a cam member disposed against said plunger rod and having an opening therein removably receiving said pivot post, an elongated locking lever having an end removably held in said opening in said plunger rod and being adapted to hold said cam member against said plunger rod, said actuating bar having an integral hook shaped locking portion adapted to move said lever with respect to said plunger rod upon movement of said actuating bar relative to said plunger rod to cause said locking lever to exert frictional force on said cam member and hold said cam member in fixed position with respect to said plunger rod, said hook shaped locking portion having an open side to receive said plunger rod and said lever therethrough when said plunger rod and said locking lever are pivoted with respect to said actuating bar to facilitate assembly and disassembly.

4. A presettable pushbutton slide mechanism including in combination, a slidable actuating bar and a plunger rod having mutually engageable means removably holding said actuating bar and said plunger rod in slidable relationship, said mutually engageable means being disengageable when said plunger rod is pivoted with respect to said actuating bar, said plunger rod further having an outwardly projecting portion having a slot therein, a pivot post with a free end projecting from said plunger rod, a cam member disposed against said plunger rod and having an opening therein removably receiving said pivot post, an elongated locking lever having a notched end removably captured in said slot in said outwardly extending portion of said plunger rod and being adapted to hold said cam member against said plunger rod, said actuating bar having an integral hook shaped locking portion adapted to move said lever toward said plunger rod upon movement of said actuating bar relative to said plunger rod to cause said locking lever to exert frictional force on said cam member to hold said cam member in fixed position with respect to said plunger rod, resilient means biasing said locking lever against said locking portion, said hook shaped locking portion having an open side permitting movement of said plunger rod and said locking lever therethrough as said plunger rod is pivoted with respect to said actuating bar, whereby said slide mechanism may be assembled and disassembled respectively by pivoting said plunger rod and said locking lever into and out of said locking portion.

References Cited by the Examiner

UNITED STATES PATENTS

2,266,711	12/41	Crosby et al.	74—10.33
2,301,090	11/42	Teaf	74—10.33
2,489,544	11/49	Schwarz et al.	74—10.33
2,659,236	11/53	Allen	74—10.33
2,793,531	5/57	Thompson	74—10.33
2,800,027	7/57	Schwarz	74—10.33
2,930,241	3/60	Roback	74—10.33
3,086,401	4/63	Horton	74—10.33

FOREIGN PATENTS

742,939	1/56	Great Britain.

BROUGHTON G. DURHAM, *Primary Examiner.*