Sept. 30, 1958 F. G. MASON 2,853,882

FINE-TUNING MECHANISM

Filed Sept. 26, 1957

Fig. 1

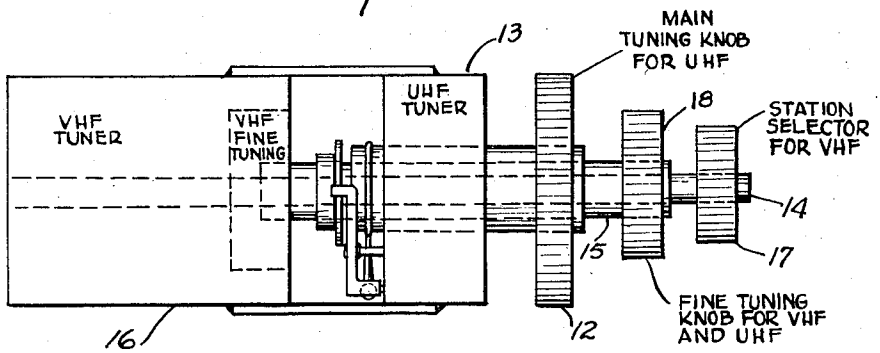


Fig. 2

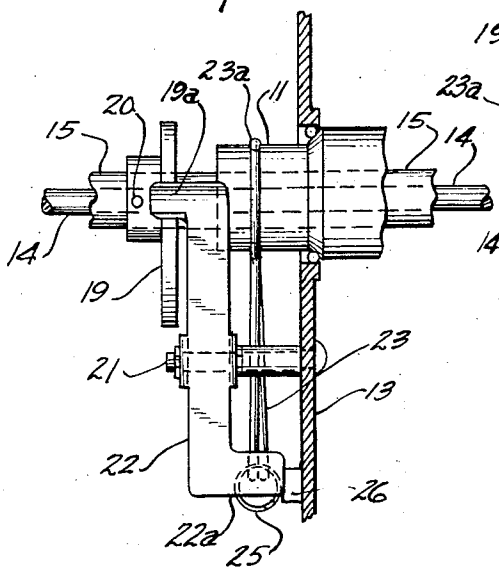


Fig. 3

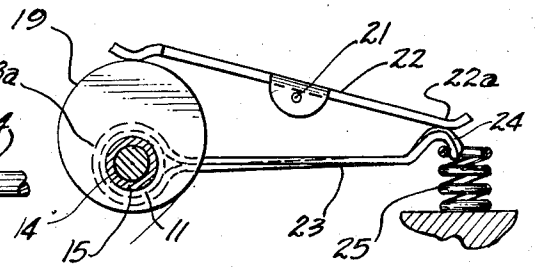
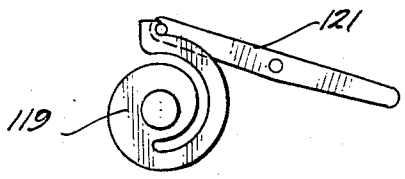


Fig. 4.



INVENTOR.
Francis G. Mason

BY
Coms, McDougall, Williams & Hersh
Attorneys

United States Patent Office 2,853,882 Patented Sept. 30, 1958

2,853,882

FINE-TUNING MECHANISM

Francis G. Mason, Westport, Conn., assignor to Aladdin Industries, Incorporated, Nashville, Tenn., a corporation of Illinois

Application September 26, 1957, Serial No. 686,427

7 Claims. (Cl. 74—10.54)

This invention relates to a mechanism for mechanically affording fine or precise tuning in adjustable apparatus which is tuned by rotation of a shaft. Typical of such apparatus is a modern television tuner. More particularly, my invention relates to an apparatus which can be employed with a dual or tandem television tuner, having V. H. F. and U. H. F. sections, to effect fine tuning of both the V. H. F. and U. H. F. circuits with a single manual control knob.

Hence it is an object of my invention to provide a simple means for making fine adjustments of a shaft-actuated tuner, such fine tuning being manually operable by means of a second shaft, mounted concentrically with respect to the main tuning shaft.

In the achievement of the aforementioned object, my invention has as a secondary object the achievement of accurate fine tuning by apparatus of great simplicity and low cost.

A further, and more specific, object of the invention is to provide a convenient and inexpensive fine-tuning mechanism for use with tandem television tuners having separate V. H. F. and U. H. F. sections.

Other objects and advantages of the invention will appear from the following description of a typical embodiment thereof.

In the appended drawing, Figure 1 is a diagrammatic illustration of a television tuner arrangement employing my invention for effecting fine tuning, with a single knob, of both V. H. F. and U. H. F. circuits. In order to bring out the relative relationships of the various shafts involved, the diameters of the shafts in Fig. 1 have been intentionally exaggerated. Fig. 2 is a side elevation view, partly in section, showing the fine-tuning mechanism, generally depicted in Fig. 1, which is the heart of my invention. Fig. 3 is a diagrammatic fragmentary sketch showing certain portions of my fine-tuning mechanism and illustrating the manner in which they cooperate. Fig. 4 is a fragmentary diagrammatic view showing an alternative type of cam mechanism which may be employed in a fine-tuning mechanism embodying my invention.

As heretofore pointed out, my invention is particularly useful in television receiving apparatus of the type having separate tuners for covering the V. H. F. channels and the U. H. F. channels. Such receivers normally have the tuners for the respective frequency ranges mounted in front of one another and tuned by means of concentric shafts. In some cases, the tuning of the V. H. F. and U. H. F. circuits is accomplished by means of a single knob, rotation of the knob through a part of its range being operative to actuate the V. H. F. tuner, while continued rotation of the knob beyond a certain point switches in the other tuner and causes it to be adjusted in frequency. In other cases, concentric shafts are employed for tuning of the respective circuits in the U. H. F. and V. H. F. sections of the tuner.

Whichever of the foregoing modes of operation be employed in a particular case, it is decidedly advantageous

to provide a single fine-tuning control which will operate on both frequency ranges.

For illustrative purposes, I have shown in Fig. 1 an arrangement in which V. H. F. and U. H. F. tuners are mounted in tandem and in which separate main tuning knobs are provided for the U. H. F. and V. H. F. ranges.

In Fig. 1 the tuning mechanism comprises three shafts arranged concentrically. The outermost shaft **11** is controlled by manual knob **12** and is employed as a main tuning knob for the U. H. F. tuner **13**. Shaft **11** passes entirely through the housing of tuner **13**, projecting a short distance in back thereof, as is shown more clearly in Fig. 2.

The innermost shaft **14** and the intermediate shaft **15** both pass entirely through the outer shaft **11** and extend therebeyond into the housing of the V. H. F. tuner **16**, shown diagrammatically in Fig. 1. The coarse tuning of the V. H. F. tuner is accomplished by shaft **14** under the control of manual knob **17**, and the fine tuning of the V. H. F. tuner is achieved by means of shaft **15** under the control of manual knob **18**.

The details of the structure by means of which coarse and fine tuning of the V. H. F. tuner is accomplished are not material to the present invention and need not be described herein, since any of the conventional tuning methods may be used. Similarly, the electrical and mechanical details of the apparatus by means of which the U. H. F. tuner **13** is tuned by means of the shaft **11** need not be described herein, since they also may be conventional. That is, rotation of shaft **11** may result in adjustment of a variable condenser, in tuning of a resonant cavity, or in any other suitable change in the circuit elements which make up the U. H. F. tuner. As will be presently explained, the fine-tuning mechanism which is the central feature of the present invention is mechanical in character and results in slow, finely controlled movement of the shaft **11** responsively to rotation of the fine-tuning shaft **15** by means of manual knob **18**.

In the arrangement of Fig. 1, fine tuning of both the V. H. F. and U. H. F. tuners may be achieved by rotation of manual knob **18**. V. H. F. fine tuning, as previously mentioned, may be accomplished inside the housing **16** of the V. H. F. tuner in any conventional manner. I shall now explain the manner in which I achieve fine tuning of the U. H. F. tuner by rotation of that same shaft **15**.

On shaft **15** beyond the rearward end of shaft **11**, I provide a cam **19**, rigidly secured to shaft **15** in any suitable manner, as by means of key **20**. On the back face of the housing of the U. H. F. tuner **13**, I provide a pivot element **21**, on which is pivotally mounted a cam follower **22**. Cam follower **22** is pivoted on the pivot **21** intermediate its ends. The end adjacent the cam **19** is suitably modified at **19***a* to bear against the surface of cam **19**, while the other end of follower **22** presses against a spring lever **23**.

Lever **23** is made of spring wire looped once around the shaft **11**, the loop **23***a* being carried in an annular recess formed in shaft **11** for that purpose, the ends of the aforementioned loop being extended laterally away from the shaft **11** and finally being brought together and bent into the form of a spring seat **24**. A compression spring **25** is seated between the spring seat **24** at the outer end of lever **23** and a suitable spring seat **26**, which is formed by stamping or otherwise provided on the rear face of the housing of tuner **13**. The end of cam follower **22** on the opposite side of pivot **21** from the follower surface **19***a* is modified as at **22***a* to press against the spring-seat portion **24** of the lever **23**. This construction results in spring **25** being normally compressed to a greater or lesser degree depending on the position of cam **19** and hence on the position of follower **22**.

That loop of spring wire which forms a part of lever **23** functions as a friction clutch on the shaft **11**. Translational movement of the lever **23** will produce corresponding rotation of the shaft **11**, since the frictional grip of the lever **23** on the shaft **11** is greater than the friction developed in the bearings by which the shaft **11** is carried in the U. H. F. tuner **13**.

As a result, rotation of the shaft **11** through a limited arc may be accomplished by manual rotation of the knob **18**. The manner in which this is accomplished is as follows: Rotation of knob **18** results in rotation of shaft **15** and hence in rotation of cam **19**. Movement of cam **19** causes follower **22** to rock on pivot **21**, resulting in expansion or contraction of the spring **25** and in corresponding translational movement of the lever **23**. This produces equivalent movement of shaft **11**, although at a very much slower rate than would equivalent manual rotational motion applied to knob **12**. Hence it is possible, by adjustment of knob **18**, to achieve excellent and accurate fine tuning action of both the V. H. F. and the U. H. F. tuners.

The fine-tuning mechanism just described does not interfere with manual rotation of knob **12** for purposes of coarse tuning of the V. H. F. tuner **13**, since the spring-wire loop **23***a* slips in its groove on shaft **11** whenever shaft **11** is rotated manually.

The cam **19** is shown in Figs. 1–3 as a conventional circular cam eccentrically mounted on the shaft **15**. Such a cam will provide effective fine tuning through 180° rotation of knob **15**. It will of course be understood that cams of other conformations may be employed to produce even slower relative movement of the shaft **11** with rotation of the knob **15**. Thus, for example, an alternative cam is shown in Fig. 4 and marked **119**, which is designed for cooperation with a modified type of cam follower **121**, having a pin designed to bear against the cam surface. Cam **119** will yield fine tuning of shaft **11** over a range of 540° rotation of knob **18**.

In most cases, the cam employed in my fine-tuning mechanism will be so designed as to provide similar fine-tuning behavior for the V. H. F. and U. H. F. ranges. That is, if the design of the V. H. F. tuner is such that a cycle of fine tuning requires 180° rotation of shaft **15**, then a cam providing a 180° cycle of fine tuning will ordinarily be used for the U. H. F. mechanism.

It will be understood that my description of the invention in connection with a tandem U. H. F. and V. H. F. tuner assembly is merely illustrative. Obviously, my mechanism may, if desired, be used on many other types of apparatus and combinations of elements. Similarly, the structural details shown may be varied extensively by persons skilled in the art without departing from the principles and spirit of my invention.

I claim:

1. In combination with a rotary shaft, a second shaft rotatably mounted coaxially with said first shaft, manual means for rotating said second shaft, an arm slippably clutched to said first shaft and extending away laterally therefrom, a cam rigidly joined to said second shaft for rotation therewith, a cam follower pivotally mounted adjacent said cam, one part of said follower being positioned to bear on said cam and another part of said follower being positioned to bear against said arm, and resilient means urging said arm against said cam follower, rotation of said second shaft and said cam being operative through said follower to rock said arm and thereby to rotate said first shaft through a limited arc, the torque required to rotate said first shaft being less than the torque transmitted to said shaft by said slippably clutched arm.

2. In combination with a rotary shaft, a second shaft rotatably mounted coaxially with said first shaft, manual means for rotating said second shaft, an arm slippably clutched to said first shaft and extending away laterally therefrom, a cam rigidly joined to said second shaft for rotation therewith, a cam follower pivotally mounted adjacent said cam, one part of said follower being positioned to bear on said cam and another part of said follower being positioned to bear against said arm, and resilient means urging said arm against said cam follower, rotation of said second shaft and said cam being operative through said follower to rock said arm and thereby to rotate said first shaft through a limited arc, the torque required to rotate said first shaft being less than the torque transmitted to said shaft by said slippably clutched arm, said first shaft being directly rotatable independently of said arm when subjected to torque sufficient to cause slippage of said arm thereon.

3. In combination with a rotary shaft, a second shaft rotatably mounted coaxially with said first shaft, manual means for rotating said second shaft, a cam rigidly joined to said second shaft for rotation therewith, an arm of resilient material snugly gripped around said first shaft to provide a slippable frictional clutch therewith, said arm extending laterally away from said first shaft, and a pivotally mounted cam follower extending between said cam and said arm, operative on rotation of said second shaft and said cam to impart a rocking movement to said arm and thereby to rotate said first shaft through a limited arc by torque transmitted through said slippable clutch, said first shaft being directly rotatable independently of said arm when subjected to torque sufficient to cause slippage of said friction clutch.

4. In combination with a rotary shaft, a second shaft rotatably mounted coaxially with said first shaft, manual means for rotating said second shaft, a cam rigidly joined to said second shaft for rotation therewith, said first shaft having an annular groove in its surface, the plane of said groove being perpendicular to the axis of said shaft, an arm carried by said first shaft and extending laterally away therefrom, said arm comprising a clutching portion formed of resilient material and seated in said groove, and a cam follower pivotally mounted near said shafts and defining a mechanical linkage between said cam and said arm, rotation of said second shaft and said cam being operative through said follower to rock said arm and to rotate said first shaft through a limited arc by torque transmitted thereto via said clutching portion and said groove.

5. In tuner mechanism for wave-signal receiving apparatus, having a first section adapted to tune over a first frequency range, a second section adapted to tune over a second frequency range, and three coaxially mounted shafts, the innermost of said shafts being operative on rotation to effect coarse tuning of said first section, the intermediate one of said shafts being operative on rotation to effect fine tuning of said first section, and the outermost of said shafts being operative on rotation to effect tuning of said second section, means for causing rotation of said intermediate shaft to also effect fine tuning of said second section, comprising a cam rigidly secured to said intermediate shaft, a laterally extending arm frictionally clutched to said outer shaft, a pivotally mounted cam follower mechanically linking said cam and said arm, and resilient means urging said follower to bear against said cam, rotation of said intermediate shaft and cam being operative through said follower to rock said arm and to rotate said outer shaft through a limited arc, said arm being slippable on said outer shaft to permit direct rotation thereof when sufficient torque is applied thereto.

6. In tuning mechanism for a wave-signal receiver having a first section adapted to tune over a first frequency range, a second section adapted to tune over a second frequency range, and three coaxially mounted shafts, including a first shaft operative on rotation to effect coarse tuning of said first section, a second shaft operative on rotation to effect fine tuning of said first section, and a third shaft operative on rotation to tune said second section, means for causing rotation of said second shaft to also effect fine tuning of said second section, comprising a cam rigidly secured to said second shaft for rotation there-

with, an arm frictionally clutched to said third shaft and extending laterally away therefrom, and a pivoted cam follower mechanically linking said cam and said arm, rotation of said second shaft and said cam being operative to rock said arm and thereby to rotate said third shaft through a limited arc responsively to torque transmitted to said third shaft via said frictionally clutched arm.

7. The apparatus of claim 6 wherein said third shaft is provided with an annular groove for receiving said arm, said arm having a resilient gripping portion seated in said groove.

No references cited.