May 10, 1966 N. J. KAZYK ETAL 3,251,012

TUNING APPARATUS WITH DETACHABLE F.M. SECTION

Filed March 23, 1964

Fig. 1.

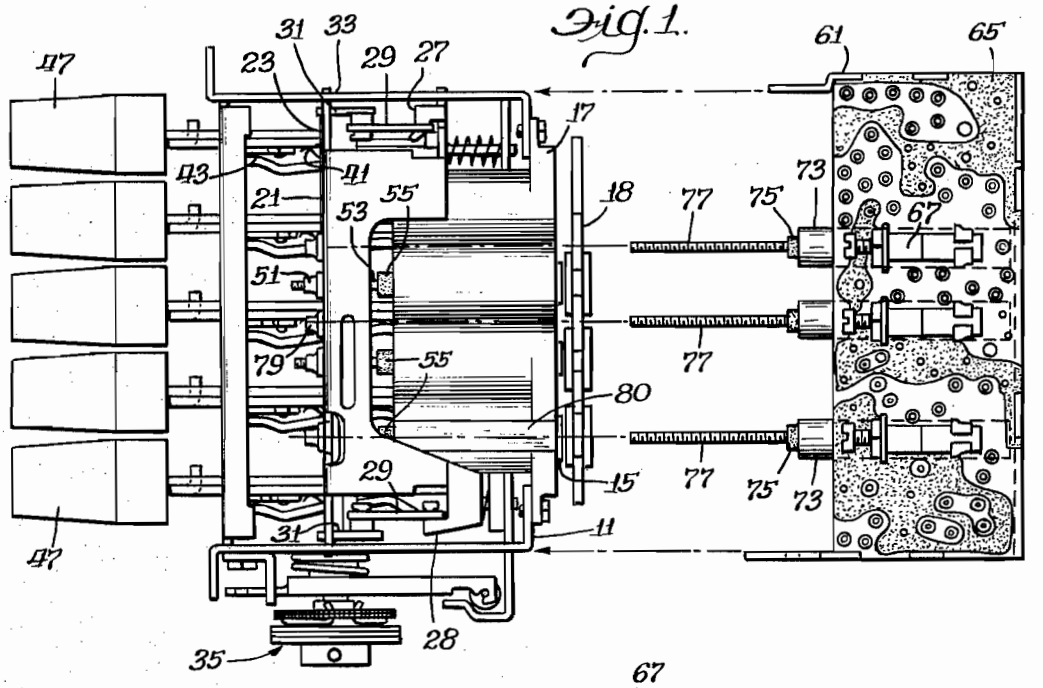


Fig. 2.

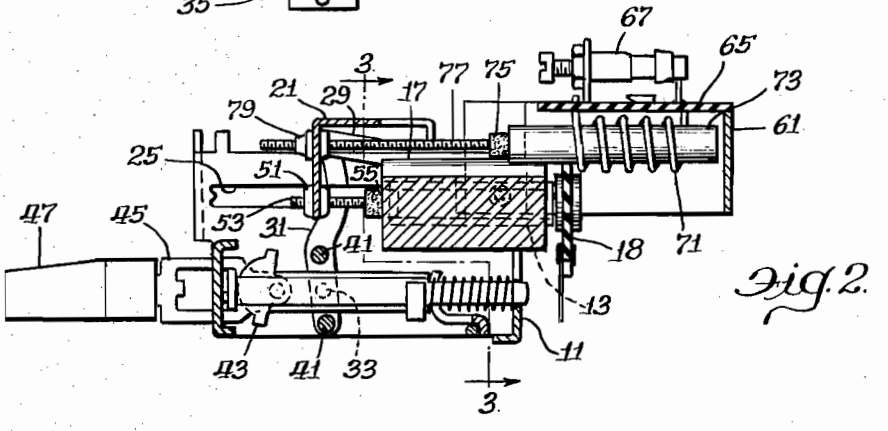
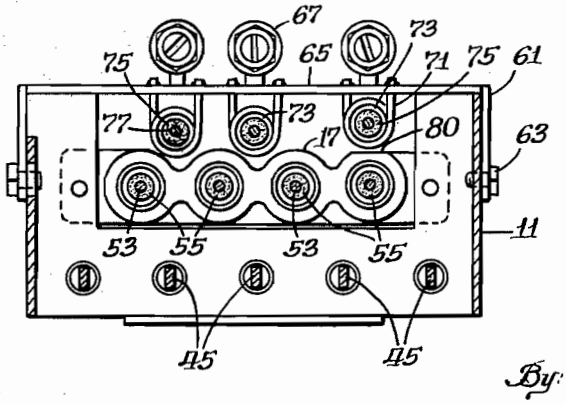


Fig. 3.



INVENTORS.
Norbert J. Kazyk
Frank R. Mikuls
By: Mueller & Aichele Attys.

United States Patent Office 3,251,012 Patented May 10, 1966

3,251,012

TUNING APPARATUS WITH DETACHABLE F.M. SECTION

Norbert J. Kazyk, Norridge, and Frank R. Mikuls, Bensenville, Ill., assignors to Motorola, Inc., Chicago, Ill., a corporation of Illinois

Filed Mar. 23, 1964, Ser. No. 353,969
2 Claims. (Cl. 334—1)

This invention relates to radio receivers, and more particularly to a pushbutton operable tuner for a radio receiver adapted for A.M. and F.M. reception.

Certain automobile users find it desirable to be able to receive both amplitude modulated (A.M.) broadcasts and frequency modulated (F.M.) broadcasts with their automobile radio receivers. Other automobile users do not wish to assume the cost of an A.M. and F.M. receiver and obtain only an A.M. receiver. When a different tuner construction is used for each type of receiver, manufacturing costs are compounded due to production, installation, and inventory problems. Furthermore, if the owner of an automobile desires F.M. reception some time after initially purchasing a receiver equipped for only A.M. reception, he must often replace his entire unit.

A solution to the above difficulties is to provide a tuner which is adapted for both A.M. and F.M. reception in all radio receivers manufactured. Such a practice, however, adds to the cost of the basic receiver, forcing the consumer who does not desire F.M. reception to pay for additional equipment. An alternative solution is to add a separate F.M. tuner in the event F.M. reception is desired. The added tuner, however, may require more space than is available in the automobile, or may occupy so much space as to be unsightly or inconvenient.

Accordingly, it is an object of this invention to provide an improved tuner for a radio receiver adapted for A.M. and F.M. reception.

Another object of the invention is to provide a radio receiver for an automobile having an A.M. tuner which may be readily modified for F.M. reception while occupying a minimum of additional space.

Still another object of the invention is to provide a radio receiver and A.M. tuner adapted for the addition of F.M. reception thereto, and wherein the cost of the basic radio receiver unit is minimized.

A still further object of the invention is to provide a radio receiver wherein both F.M. and A.M. tuning may be accomplished automatically through the use of pushbuttons.

A feature of the invention is the provision of a pair of frame structures, one mounted upwardly and rearwardly of the other and each carrying a horizontally disposed row of coils for F.M. and A.M. tuning, respectively, and a single core carriage mechanism for moving cores in all said coils.

Another feature of the invention is the provision of an F.M. tuner coil section removably mounted rearwardly and upwardly of the A.M. tuner coil section and having linearly displaceable cores therein connected to the same core carriage as the cores for the A.M. section.

Still another feature of the invention is the provision of a pushbutton operable tuner having an A.M. coil section, and a frame mounted rearwardly and upwardly of the A.M. coil section, which frame carries a printed circuit board having a horizontally disposed row of coils thereon for F.M. tuning.

A further feature is the provision of a tuner as described above wherein the F.M. coils are offset from A.M. coils to conserve space and shorten the connecting rods.

In the drawing:

FIG. 1 is a top plan view partially exploded of a tuner constructed in accordance with the invention;

FIG. 2 is a side elevational half section view of the tuner; and

FIG. 3 is a sectional view taken along the line 3—3 of FIG. 2.

In accordance with the invention, a tuner for a radio receiver adapted for F.M. and A.M. reception includes a first structure having a horizontally disposed row of coils for A.M. tuning. Core members for tuning the coils in the row are connected to a linearly displaceable tuning carriage for moving the cores in the A.M. coils. A second structure is disposed upwardly and rearwardly of the first structure and is removably secured thereto and supported thereby. The second structure carries a second horizontally disposed row of coils for F.M. tuning. These latter coils are also tuned by a plurality of core members connected to the tuning carriage to be displaced thereby.

In one form of the invention, the first and second structures may be supporting frames for the tuning elements, and the core carriage may be selectively displaced either by a plurality of manually actuable pushbuttons or by a manually actuable rotary tuning drive. The second structure may include a printed circuit panel disposed across its frame to carry a plurality of circuit elements and the row of coils associated with the F.M. tuning. The F.M. coils may be offset from the A.M. coils to conserve space.

Referring now more particularly to the drawings, a tuner constructed in accordance with the invention is shown. The tuner includes a first frame **11**, which carries a plurality of coils **13** for A.M. tuning. Coils **13** are wound on coil forms **15** which are secured inside the coil supporting structure **17** of cast metal, and to a terminal board **18**.

A tuning carriage **21**, is slidably supported by fingers **23** extending into guide slots **25** in the sides of frame **11**. Turning carriage **21** has a pair of extensions **27** and **28** at either side thereof connected through pivotal links **29** to levers **31**. Levers **31** are pivotally mounted at **33** to the sides of frame **11**. One of levers **31** is driven through a gear and clutch assembly **35**, which may be driven in a conventional manner through a manually operable rotary tuning drive.

Levers **31** are connected by a pair of treadle bars **41** extending across the tuner on either side of pivots **33**. Treadle bars **41** are engageable by each of a plurality of presettable cams **43** on pushbutton actuable slide members **45** when the respective pushbuttons **47** are depressed. Upon depression of a pushbutton **47**, treadle bars **41** will align themselves with the face of the preset cam associated with the one of slides **45** controlled by the depressed pushbutton. This displaces tuning carriage **21** to a predetermined position, as is well known in the art.

Tuning carriage **21** carries a plurality of internally threaded sockets **51**, in which are threaded rods **53**. The other end of rods **53** carry the tuning slugs or cores **55** for respective ones of coils **13**. When tuning carriage **21** is moved, the position of cores **55** in coils **13** will be changed to tune the receiver to different frequencies for A.M. reception.

As previously discussed, it is desirable to be able to readily modify an A.M. tuner for F.M. reception. In the tuner of the invention, this may be accomplished by adding a second frame **61** removably secured by means of screws **63** to frame **11** rearwardly and upwardly thereof. Frame **61** carries a circuit board **65**, which may be a printed or laminated circuit board, for supporting the various components of the F.M. tuner section. As shown in the drawings, circuit board **65** carries a plurality of

adjustable capacitors **67** for adjusting the tuning of the F.M. portion of the radio receiver to its optimum condition. A plurality of coils **71** are suspended from circuit board **65** on the underside thereof inside wrap-around frame **61** and about coil forms **73**. Cores **75** are disposed inside the cylindrical coil forms **73** for tuning coils **71** for F.M. reception in the receiver. Cores **75** are connected through threaded rods **77** which extend over coils **13** to sockets **79**, disposed in tuning carriage **21** above sockets **51**. Accordingly, movement of tuning carriage **21** will not only adjust the position of cores **55** in coils **13** for A.M. tuning, but will also adjust the position of cores **75** in coils **73** for F.M. tuning.

The F.M. coils **71** may be offset from coils **13** as may be seen by the two furthest left coils **71** in FIG. 3. This conserves vertical space while maintaining minimum length in rods **77**. If too much mutual inductance exists, coils **71** may have to be set further apart as is the furthest right coil **71** in FIG. 3. If such is the case, a flat **80** may be provided in structure **17**, and the coil may be mounted closer to board **65**.

As a result of utilizing a tuner constructed in accordance with the invention, only one basic tuner need be manufactured, greatly reducing manufacturing costs. In addition, very little additional space is required for the additional F.M. portion, facilitating later modification of existing A.M. tuners. Additional F.M. circuitry will, of course, have to be incorporated in the receiver circuitry, not shown, for F.M. reception. Switching may be provided in the receiver circuitry, to which circuitry for F.M. reception is added, so that tuning coils **13** and **73** may be selectively switched into and out of the receiver circuitry, depending on whether A.M. or F.M. reception is desired.

The pushbutton slides **44** may be adjusted to preset the cams **43** for all A.M. tuning, or all F.M. tuning, or a mixture of both. Threaded rods **77** and **53** may be made flexible for shock absorption, and sockets **79** and **51** may be of resilient plastic for minimization of backlash. When the coil support structure **17** is cast in a shape such as is shown in FIG. 3, it will be seen that slight depressions are left on the upper surface thereof. Proper placement of coils **71** and circuit board **65** will permit the coils to be disposed in these depressions to further minimize the vertical dimension of the tuner.

It may therefore be seen that the invention provides an improved tuner for A.M. and F.M. radio receivers. The F.M. section of the tuner may be readily added or removed and occupies a minimum of space. The tuner may be operated by presettable pushbutton mechanisms in the tuner, or through conventional manual knob operation.

We claim:

1. A tuner for a radio receiver adapted for A.M. and F.M. reception including in combination, a first frame, a first horizontally disposed row of coils for A.M. tuning secured to said first frame, a tuning carriage slidably mounted on said first frame, actuating means for linearly displacing said tuning carriage, a plurality of first core members connected to said tuning carriage to be displaced thereby, said first core members being disposed in said coils in said first row for tuning the same according to the position of said tuning carriage, a second frame removably secured to said first frame rearwardly and upwardly thereof, a printed circuit board secured to said second frame, at least one adjustable capacitor and a second horizontally disposed row of coils for F.M. tuning secured to said printed circuit board, said coils of said second row being parallel to each other and parallel to said coils of said first row, and a plurality of second core members connected to said tuning carriage to be displaced thereby, said second core members being disposed in said coils in said second row for tuning the same according to the position of said tuning carriage, whereby displacement of said tuning carriage by said actuating means will tune the receiver for both A.M. and F.M. reception.

2. A tuner for a radio receiver adapted for A.M. and F.M. reception including in combination, a first frame, a first horizontally disposed row of coils for A.M. tuning mounted to said first frame, a tuning carriage slidably mounted on said frame in front of said first row, actuating means for linearly displacing said tuning carriage, said actuating means comprising a plurality of pushbutton elements and further comprising a manually operable rotary mechanism, a plurality of first core members connected to said carriage to be displaced thereby, said first core members being disposed in said coils in said first row for tuning the same according to the position of said tuning carriage, an add-on F.M. tuner including a second frame removably secured to said first frame rearwardly and upwardly thereof, a printed circuit board mounted to said second frame, a plurality of circuit elements mounted to said circuit board including a plurality of adjustable capacitors and a second horizontally disposed row of coils for F.M. tuning, a plurality of second core members, and means positioned above said first row of coils connecting said second core members to said tuning carriage to be displaced thereby, said second core members being disposed in said coils in said second row for tuning the same according to the position of said tuning carriage, whereby displacement of said tuning carriage by said actuating means will tune the receiver for both A.M. and F.M. reception.

References Cited by the Examiner

UNITED STATES PATENTS

2,158,252	5/1939	Polydoroff	336—136
2,424,506	7/1947	Sands	334—77
2,503,220	4/1950	Schaper	334—77
2,581,966	1/1952	Mitchell	334—70
3,163,837	12/1964	Teaf	334—77

HERMAN KARL SAALBACH, *Primary Examiner.*

R. F. HUNT, *Assistant Examiner.*