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UNI-CONTROL TUNING APPARATUS

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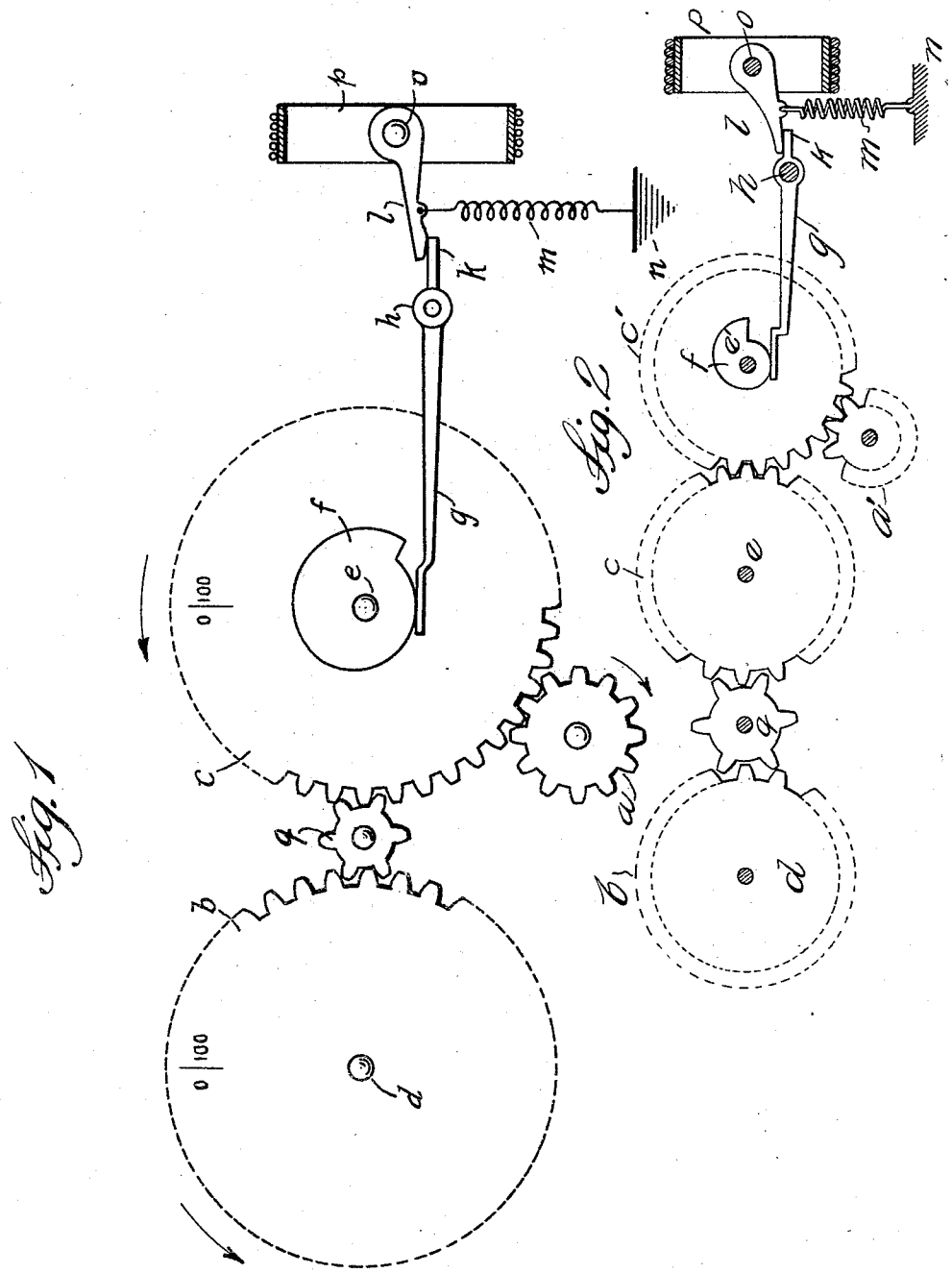

Fig. 1

Fig. 2

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UNI-CONTROL TUNING APPARATUS

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This invention relates to radio apparatus or other apparatus of similar nature requiring the accurate and careful manipulation of several different controls or operating shafts.

It is particularly related to what is known as uni-control system of tuning for wireless telegraph receiving apparatus.

In a multi-stage radio receiver, considerable difficulty is always experienced in setting the various dials and operating them in synchronism whenever a station is desired to be tuned in. A great many receivers have two, three or even more tuning dials, or control dials which must be adjusted simultaneously. This adjustment often requires expert manipulation necessitating the use of both hands. Where three dials must be tuned very accurately and an equal adjustment is desired, one person often has difficulty in view of the fact that he can only set two dials at a time with his two hands.

In some receiving apparatus, the dials are marked with indications for locating the same position of the tuning element at which a station has been heard before. Where several dials are used, the set is so designed that a numerical or other type of marking will be the same for each dial so that within definite ranges of wave lengths, the same rotation of all dials produces the same tuning for that wave length.

Thus, if the tuning of receiving apparatus is changed all of the dials must be moved in synchronism to the same point, the different settings all reading the same. With the applicant's device, this new setting may be accomplished with the use of one hand only.

In this type of receiving apparatus, inequalities in manufacture or surrounding outside influences influence the settings of the different dials slightly from each other. In this invention this difference may be taken care of and a very fine and accurate adjustment may be obtained on each dial independently of the others without the use of more than one hand.

This arrangement relates particularly to the use of several gears, chain drives or the equivalent connected to the respective operating shafts and dials for the various control elements. A vernier is geared or otherwise connected to one dial. Another gear meshes with the gear on this first dial and cooperates with that on another dial. This intermediate gear is so designed and arranged that an appreciable amount of lost motion will exist between the two dials. If a third dial is used, another intermediate lost motion gear may connect that with the second mentioned dial so that the greatest amount of lost motion will exist between the first dial and the third.

I have found that in actual practice when three tuning dials are used as in two stages of radio frequency (balanced amplification for instance) with the 1st dial tuning the aerial condenser, 2nd and 3rd dials tuning the 1st and 2nd stages of tuned radio frequency that #2 and #3 can be geared or otherwise connected together without lost motion, but there must be lost motion between #1 dial and #2. In other words, the two stages of tuned radio frequency can be handled as a unit.

Dials 2 and 3 will log together, but dial #1 has always a slightly different setting.

In addition to this type of adjustment, receiving apparatus using regeneration oftentimes requires some method of control of this feature. This invention uses a cam system or other slow motion arrangement for decreasing the amount of regeneration with increase of frequency of signal and vice versa. This cam arrangement for controlling the regeneration may be attached to any one of the different gears. This provides an easy and simple method of operating the tuning elements and the amount of lost motion may be used to double efficiency by approaching the critical tuning point on the dial at the end of the gear train from either direction. In one direction the lost motion or back-lash as it is often called, can be used to control the other gears in the opposite direction by approaching the critical point of the third or last dial in the reverse direction and a different adjustment may be obtained throughout the range of the back-lash.

This construction also is of advantage

from a manufacturing and practical point of view. It is constructed with little complicated apparatus that may not easily be thrown out of adjustment. Further and more definite objects will become apparent from the specification when read in conjunction with the accompanying drawings, on which, Fig. 1 is a view of the gearing arrangement whereby two tuning elements and a regeneration control are operated and Fig. 2 is a modification of the form shown in Fig. 1 with an additional control element.

On Fig. 1 of the drawings, *a* is a vernier or reduction speed gear connection having the manual control knob not shown. This vernier gear is connected directly to one of the control elements attached to shaft *e* by meshing with gear *c*. This control element may be a condenser, movable coil or other equivalent apparatus. The fit between the teeth of gears *a* and *c* should be reasonably accurate and no loose play is necessary here. *q* is a small intermediate gear which also meshes with *c* cooperating with the gear *b* mounted on the control shaft *d* of another control element such as condenser movable coil or the like. If a third control element is used, another gear *q* and *b* will be required.

On the shaft *e* is mounted the cam *f* which is engaged by the lever *g* pivoted at *h*. The lever *g* extends beyond *h* and ends in the terminal *k*. *o* is a shaft operating the regeneration control such as tickler, condenser, rheostat or the like, as shown at *p*. Rigidly connected to this shaft is the arm *l*, biased in one direction by spring *m*, fastened to rigid support *n*. The terminal *k* holds the arm *l* against the bias of the spring *m*.

In the operation of this arrangement, if a station having a known dial setting is desired to be tuned in, the vernier knob mounted on the shaft of gear *a* may be rotated to the point where the dial connected to gear *b* indicates the exact setting desired. This operation may leave the dial connected to gear *c* at a point slightly off the most efficient tuning. Upon rotating the vernier gear *a* in the reverse direction, this inaccuracy may be corrected within the limits of the lost motion produced in intermediate gear *q*. The regulation of the regeneration control *p* is automatically taken care of during this operation by the cam *f*, which increases through regeneration at lower signal frequencies and decreases at higher.

In the modification shown in Fig. 2 a third control shaft *e'* has been geared directly to the control shaft *e*, so that the control elements *e* and *e'* are tuned as a single unit, there being, no lost motion between *e* and *e'*, while the control element *d* is as in Fig. 1 operated through the lost motion gear *q* whereby the control element *d* may be adjusted separately. In this form the cam *f* is shown on the control element *e'*, although it could be located in any one of the control elements. The vernier *a'* is shown driving the gear *c'* although the vernier *a'* could be meshed with either *c* or *c'*. The regenerative control shown in this modification is similar to the one shown in Fig. 1.

In the operation of this arrangement the dial on the control element *b* is turned by means of the vernier *a'* to the desired point. This operation leaves the dials *c* and *c'* slightly past the point where maximum signal is obtained. The dials *c* and *c'* are now turned back to their exact setting. The lost motion gear *q* allows this last setting to be made without disturbing the setting of dial *b*.

Having thus described my invention, in general and specific forms, I do not wish to be limited by the exact form described but only by the extent of the appended claims. All gear connections might be replaced by belt drives, chain and sprocket drives or the like.

I claim:

1. In combination, tuning dials, tuning elements attached thereto, a gear attached to each tuning element, regeneration control dial, regeneration control elements attached thereto, means for interconnecting said elements, including lost motion gears between the tuning element gears, a single operator acting directly on one of said tuning dials and indirectly through said inter-connecting means on others of said tuning dials, whereby the lost motion in said inter-connecting means may be used to obtain a final adjustment between said dials and means associated with one of said tuning elements to operate said regenerative control.

2. In a radio receiving apparatus, tuning indicators tuning elements attached thereto, gears for inter-connecting said indicators having a lost motion adjustment, and a single operating gear acting directly on one of said first named gears and indirectly through said inter-connecting gears on another of said first named gears.

3. In a radio receiving apparatus, tuning indicators tuning elements attached thereto, a regeneration control indicator, regeneration control mechanism attached thereto, gearing including lost motion, gears for inter-connecting said tuning indicators and said regenerative control indicator, a single operating means acting directly on one of said tuning elements and indirectly through said lost motion inter-connecting gears on the other tuning elements whereby inaccuracies of tuning between the various indicators may be corrected.

4. In apparatus for control of a plurality of circuits, tuning elements associated with each circuit, gearing means connected to the tuning elements and arranged for interconnecting said tuning elements for simultaneous adjustment, said gearing means having lost motion connections between portions

thereof connected to the tuning elements of said circuits whereby simultaneous adjustment of all of said tuning elements and small individual adjustments of each of two elements may be secured.

5. In apparatus for control of a plurality of circuits, tuning elements associated with each of said circuits, a gear on one of said tuning elements, a second gear on another tuning element in mesh with the first named gear, and a lost motion connection between the second named element and a third element, whereby the first and second named elements may be controlled as a unit without disturbing the setting of the third element.

6. In apparatus for the control of a plurality of circuits, tuning elements associated with each of said circuits, a gear fixed to one of said tuning elements, a second gear fixed to another of said tuning elements, and adapted to be driven by said first named gear, a third gear fixed to another of said tuning elements, a lost motion gear operatively interposed between said second and third named gears, and a single operator comprising a gear acting directly through said first named gears and indirectly through the other gears to impart simultaneous adjustment to all of said elements and individual accurate adjustment to several of said elements.

7. In apparatus for the control of a plurality of circuits, tuning elements associated with each of said circuits, a gear on one of said tuning elements, a second gear on another tuning element associated with said first named gear, a third gear on another tuning element, and a lost motion connection between the second and third named gears, whereby the first and second named elements may be controlled as a unit without disturbing the setting of the third element.

8. In a radio receiving apparatus a plurality of tuning elements, an indicator on each tuning element, a gear associated with each indicator, lost motion gears operatively interposed between alternate ones of said first named gears and a single operator acting directly on one of said first named gears and indirectly through said lost motion gears on the others of said first named gears.

9. In radio receiving apparatus, tuning elements, tuning indicators attached thereto, driving gears for said indicators, lost motion gearing connecting said driving gears, and a single operating gear acting directly on one of said driving gears, whereby one of said driving gears may be operated directly by said operating gear and another of said driving gears may be operated indirectly by said operating gear.

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