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Atwater Kent - Variable Condensers

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[*Normally* Radio Age *uses modern terminology, e.g., "capacitors" rather than "condensers," but in this case, authors Thompson and Bassett felt it was more appropriate to use the term prevalent in the era of the devices described in the article, and I honored that request. This is Part 5 of a series of articles on Atwater Kent by these authors, the first four of which appeared in* Radio Age *for May, July, October, and December 2005. -Editor*]

Introduction

Tuning condensers first appeared in AK factory-built radios on September 7, 1923 with the introduction of the Model 8, part # 4325 (only 17 made) and the Radiodyne 10, part # 4340. This was two years after AK started making radio components.

Why so long, considering most of the competitors were using tuning condensers? Possibly because Mr. Kent's factory had already developed expertise in the production of automotive coils, so inductive tuners were a logical choice. Initially there were few broadcast frequencies in use, and inductive tuning worked just as well as capacitive tuning over this narrow range.

As radio became more popular, more frequencies were added, and the limitations of inductive tuning became apparent. At this point AK joined the rest of the industry in using capacitive tuning. Despite the fact that

Figure 5-1. Type E tuning condenser # 4117.

AK was slow in using the condenser tuning units for its factory-built sets, individual parts were made available to homebrewers and experimenters much earlier. This

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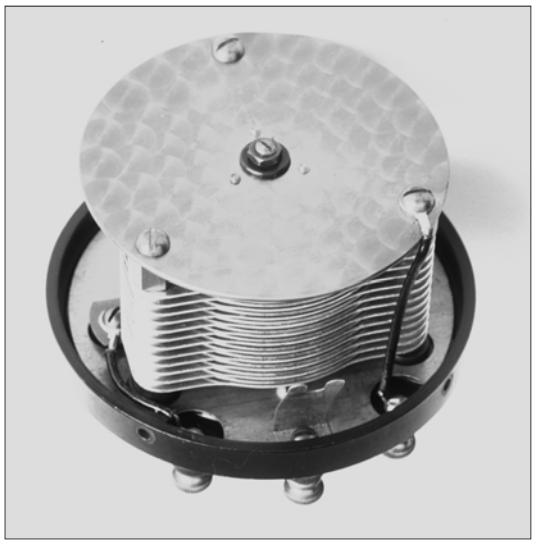

Figure 5-2. Rear view of Type E tuning condenser, showing jeweling pattern and ground clip.

Figure 5-4. Type P tuning capacitor #4165, side view showing ID plate and terminals.

(Continued from page 1)

chapter will attempt to trace the changes made in the mechanical design of the tuning condensers, as they were used in the progression of AK breadboard radio circuitry.

Separate Components

The first tuning condenser was the Type E [1], part # 4117 (Figs. 5-1 and 5-2), offered in a table or "laboratory" style mount, with a dial and connection terminals on top.

The Type E condenser consisted of 23 plates (12 stator, 11 rotor) shaped like those of the first style in Figure 5-3 (see page 4). Both the rotor and stator were isolated from ground. The ground connection was a spring clip that made contact with the inside of the metal case. The rear plate that provided the pivot for the rotor shaft is made of solid brass, and is decorated with a pattern of interlocking circles. This design is called "machine turning" or "jeweling" (Fig. 5-2). The Type E was never used in any factory-built radios. It was offered only to experimenters and those building their own sets.

The second condenser, Type P, part # 4165 (Fig. 5-4), appeared in the June 1923 factory brochure along with the Type E # 4117. The # 4165 had 23 plates (12 stator, 11 rotor) and a jeweled back plate as in the # 4117. A metal ID plate, mounted to the back plate, identifies this part as a Type P. The Type P was open, with no metal case. The rotor terminal connection is at the rear of the Bakelite front panel. The stator connection is on the rear plate. There is no ground connection. This model was designed to be mounted on the insulated front panel of a homebrew set.

The dial had graduations from 100 to 0 left to right, the 0 position corresponding to minimum capacitance as shown in Fig. 5-5. On this and all other stand-alone tuning condensers, except the last version, values increased with clockwise rotation.

The third condenser unit has a more familiar appearance. Part # 4270 (Figs. 5-6 and 5-7) came in a shield can with mounting feet on the side, so it could be mounted horizontally for front tuning. This is the configuration seen on all of the AK breadboard sets. This part has the same mechanical design as the # 4117, with 12 stator and 11 rotor plates of the early shape, and a jeweled brass rear plate. A metal plate on top of the can identifies this as a "Type F Variable Condenser".

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Figure 5-3. Reference chart showing the four basic styles of AK tuning condensers described below. (Styles 1 through 4, left to right.)

The stator plates of all the variable condensers used on the "open sets" (or "breadboards," as we now call them) had the same shape. There were two rotor types. The original version, shown on the left, was symmetrical. All later versions had one end rounded, but the orientation changed. The number of rotor and stator plates changed with different condenser versions. The four basic styles, as referenced in the article, are as follows:

Style 1 (left): Symmetrical rotor, jeweled brass rear plate. Used in the Radiodyne 10 # 4340 only, and sold as a separate component.

Style 2 (second from left): Asymmetric rotor, curved end to the left as shown, plain brass rear plate. Used in Models 10 # 4600, 10A # 4550 and # 4560, 10B # 4550 and # 4560, and 12B # 4620.

Style 3 (third from left): Asymmetric rotor, curved end to the right as shown, plain brass rear plate. Used only on the Model 10 # 4340A.

Style 4 (right): Asymmetric rotor, curved end to the right as shown, with counterbalance. Bakelite rear plate. Used in Models 9C # 4660, 10C # 4700, and 12C # 4910.

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This part was the first to be used on factory-built sets. It appeared on the 17 Model 8 radios known to have been built, and on all 4000 Radiodyne # 4340 sets [2]. Part # 4270 was also sold as a component to those building their own radios.

When the Radiodyne 10 was introduced in September 1923, few had any idea what an impact it would have on Atwater Kent's endeavor to place himself in the radio market. What followed was several months of overwhelming order volume. Although the AK factory was well-established in the auto industry, only a small portion of its space and manpower was dedicated to producing radio products.

The situation changed dramatically. What followed was a scramble to manufacture large quantities of radio parts in a short time, and expand the production space. It's very difficult for an historian to track what

Figure 5-5. Type P tuning condenser, front view, showing rotor terminal and proper dial orientation.

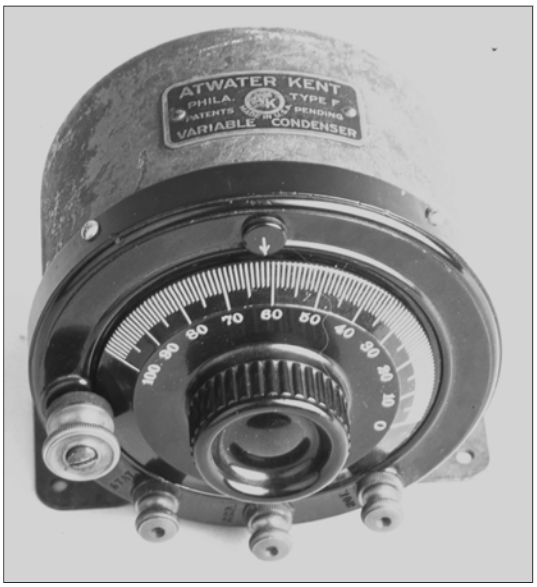

Figure 5-6. Type F tuning condenser.

happened during the early months of breadboard production. The first comprehensive parts lists came out in 1924, covering parts used to produce the last of the breadboards, the Model 10C, part # 4700. There were over 50,000 of this model made, which is one-half of the total built. This warranted listing them with the later table and console sets, which followed in the product line.

Some information about the earliest part numbers has been learned from catalogs, brochures, and factory price lists, despite the fact that Mr. Kent ordered the destruction of all records when he closed the plant in June of 1936. But little is known about the evolution of parts from the earliest offerings through the Model 10C # 4700. Much of the information presented here has been gathered by extensive examination of a large number of sets in author Thompson's collection. The fact that the serial numbers were available for all of these sets is very important. In this context, we will begin with a discussion of the Radiodyne 10 # 4340.

The Radiodyne Condensers

Soon after AK released the Radiodyne, it was discovered that another radio company (Western Coil of Racine, Wisconsin) had trademarked the name "Radiodyne." Rather than pursue an unwinnable lawsuit, AK decided to change the designation to simply the "Model 10." This was easily accomplished, since the Radiodyne name only appeared on metal tags on the three RF coils.

Whether the result of this unexpected change, or of the rapid expansion in production, or other causes, several design changes were incorporated into the condensers after this time. The following discussion is based on an examination of key serial numbers of the Model 10 radio. The entire radio will be covered in detail in a later installment. The following paragraphs focus on the design changes in the condenser units after the 4000 Radiodyne sets.

Figure 5-7. Type F tuning condenser showing terminal labels.

Figure 5-8. Tuning condenser, second version.

Figure 5-10. Tuning condenser, fourth version.

After the Radiodyne

The second version of the tuning condenser (Fig. 5-8),, used on the Model 10 # 4340A [3], looks identical exter-nally to the first Radiodyne condenser, part # 4270. The part number of this second version is unknown. Internally, the condenser still has 23 plates, but the 11 rotor plates are rounded on one end, as shown on the third style in Fig. 5-3. The shield can has no wire holes, since this design still has the thumbscrews on the front panel.

The third version of the condenser (Fig. 5-9) has no terminals on the front, although the bosses for them are still present. The 23-plate rotor and stator assembly is the same as the previous version, shown as Style 3 in Fig. 5-3. However, in this unit the rotor is connected to ground. The shield can has two holes drilled in the rear to permit routing a ground wire and stator wire which connect to the breadboard wiring. These condensers were used on the Model 10 # 4340A. The part number is unknown.

Figure 5-9. Tuning condenser, third version (terminal bosses still present).

The fourth version (Fig. 5-10) has a new Bakelite bezel. The terminal bosses are gone, leaving a smooth ring surrounding the dial. The rotor and stator have only 22 plates, one stator plate having been removed from the front of the stack. The rotor is the same as Style 2 of Fig. 5-3, but installed the same as Style 3. The rotor is wired to ground. The shield can has two holes in the rear for wiring. The part number is unknown. This part was used on the Model 10 # 4340A.

This fourth version was the first to be used on the new Model 10 # 4340A board, after the Radiodyne was discontinued, As the factory was swamped with orders in the fall of 1923, the assembly line probably used up new parts faster than they could be produced. If so, this would have forced the factory to modify parts left from the Radiodyne, plus whatever parts were available for component sales, in order to meet production demands. This would explain the fact that about 1000 sets were built with the new version condensers, then older modified parts showed up in the production run.

The fifth version is identical to the fourth, with one

Figure 5-11. Tuning condenser, sixth version.

Figure 5-13. Tuning condenser, sixth version, showing Bakelite rear plate with "ATWATER KENT" molded into the plastic.

exception: The rotor is assembled as shown in style # 2. The part number is unknown. This version was assembled in Model 10 # 4600 (the last of the bread-boards to use terminals for power connections), Model 10A # 4550 and # 4560, Model 10B # 4550 and # 4560, Model 10B (Pooley cabinet) # 4590, and Model 12B # 4620 [4].

The Redesigned Variable

The sixth and last version was a redesign, bearing part number 4565 (Fig. 5-11). Just about every part is different with the exception of the front Bakelite bezel, and the rotor positioning adjustment spring. There are only 16 plates (8 each rotor and stator) (Fig. 5-12). The rotor is mounted as shown in style 4. The rear plate is made of Bakelite. Early versions of this plate have "ATWATER KENT" in raised letters (Fig. 5-13), but this was removed from the later variant (Fig. 5-14).

This was the first version to use a counterbalance weight on the rotor. This might have been required to

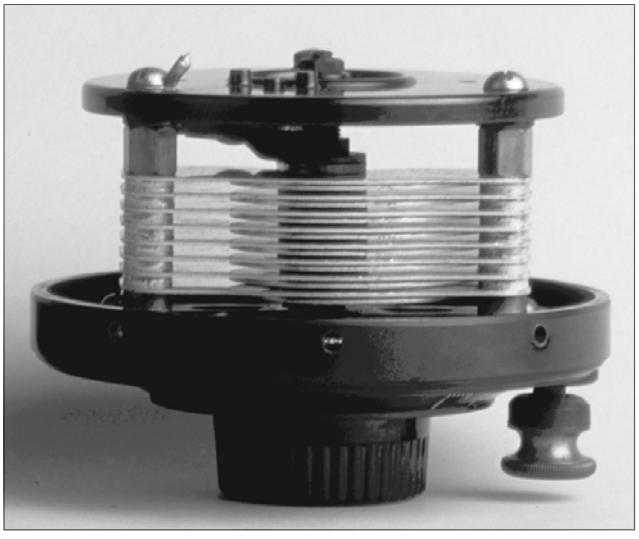

Figure 5-12. Tuning condenser, sixth version, rotor and stator detail.

Figure 5-14. Tuning condenser, sixth version, without the Atwater Kent name on the Bakelite rear plate.

Figure 5-15. Tuning condenser, sixth version, detail of wiring holes.

compensate for lighter spring pressure on the rotor, a consequence of using a Bakelite rear plate rather than brass. The rotor is mechanically tied to the shield and ground. The shield can has two holes in the bottom for the rotor and stator wires.

A new tuning dial was also introduced with this version. The scale reads in the opposite direction, with the 0 to 100 values increasing with counter-clockwise rotation. This configuration became the new standard for AK, and remained in use until the broadcast band was formalized and dials were calibrated in real frequencies, from 550 to 1550 kHz.

This version was used in Models 9C # 4660, 10C # 4700, 10C (Pooley) # 4950, and 12C # 4910.

Conclusion

This concludes our discussion of individual components. Our next chapter will discuss the self-contained tube units. As always, your comments and suggestions are welcome at the links below.

Endnotes

1. The first brochure showing part # 4117 is Atwater Kent *Form No. 60,* dated June 1923. The Type E # 4117 does not appear on the Atwater Kent factory price list dated 19 February 1923. Part numbers 4119, 4120, and 4122 appear in an AK *Radio Equipment* brochure dated April 1923.

2. Author Thompson has examined several original Radiodynes, from very early models to the last of the serial numbers, and found this to be true.

3. The A suffix identified all 4340s made after the Radiodyne name was dropped.

4. There is no record of model number 12A ever being used.

Links

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Online copies of this series, additional drawings, photos, and schematics can be found at:

http://www.AtwaterKent.Info and click on Articles.■