like to ...*I had a dial candle stick stolen once as did Jim Aita..*

Anyway, on January 7, Al Ilekis, Charley Stanley and Phil Scheltoff were all hanging around the booth and being generally in the way as well as scaring what few customers there were away. I happened to bring their attention to my bar stool high, operators chair which I sit on while presiding over my tiny enterprise.

Al commented, "there's one just like it right outside."

He was ready to head for home so I asked Charley and Phil to check on it for me and report back. Well a little while later they came back and Phil was carrying a "short" operators chair. I was about to say ... "for me, well thank you Phil and how much do I owe you?"

But he said something like "Pretty nice huh, and only $18 bucks. It should work out pretty nice in front of the (his) switchboard. And it's marked Bell System too."

Then he said, "The one you wanted us to look at is in pretty rough shape and the guy wants $65."

Now people, tell me if I'm wrong here ... if I ask Charley and Phil to go out and look at an operators chair, should this not mean any operators chair. Shouldn't Phil have purchased the chair for me or at least come back in and said ... "hey Paul, the chair Al saw is a sorry specimen but we saw this other chair that we knew you would like since we "good buddies" were looking at "ALL" operators chairs for "good buddy" Paul." And then he could have said ... "if you want I will tend your booth while you run out and look at it". And then if I didn't buy the chair, and only then should he have felt at liberty to purchase it for himself.

Paul McFadden

Up Your Nose With A:

I'll betcha the telephone man who first put those little lubricating tubes on magneto bearings never had to give them a shot of silicon or WD-40 out of an aeresol can that had a sticky squirt valve.

The Rotary Dial, 1924 To Present

By Bruce Crawford

By the early 1920's, dial central office equipment had reached a fairly high stage of perfection; this, however, was not necessarily the case with the subscriber's calling dial.

The undisputed leader in rotary dial technology was the Automatic Electric Co., which same was the company formed to exploit the Strowger patents. However, it was apparent to AECo that the dials manufactured prior to 1923 were less than satisfactory; speed regulation and dependability left something to be desired.

The Western Electric Co. had recently introduced the #2 (noisy Clicker!) dial, and one of the advantages of this dial, as noted by AECo engineers, was the use of larger terminal screws, to make replacement easier. They were not, however, impressed with the click; and, if such things as oscilloscopes had been available at that time, they would have noted that the dial did not put a good "square wave" pulse. AECo also noted that the #2 still could not be "flush" mounted. Thus, AE set out to redesign their existing product, and introduced their short lived type 23. This dial did not come up to the designer's expectations, so, in 1925, it was reworked again, and the type 24 was introduced. This unit, which, like its predecessors used a standard "ball" type governor (as used on windup gramophones, steam engines, etc.) was extremely successful, and formed the basis for all subsequent AECo dials.

When WECO introduced the "D" handset mounting, they decided to recess the dial. This necessitated the redesign of the 2-type to the 4-type; the main change, however, was to place the finger-stop inside of the case, instead of outside, as in the past. No other major change (except the spring combination) was made at this time. It is reported that certain Bell people were so unhappy with the 2 and 4 type dials that they demanded AECo dials for their phones; However there is no record that any Bell company ever standardized the AECo product.

In 1936, recognizing that they had a problem, the Bell Labs again redesigned the dial. One problem with the 2 and 4 was that it was so difficult to "wind up" that the 202 sets of the day would slide around the table unless the user held onto them; and considering that the user was supposed to be holding the handset to their ear, this was rather difficult. Another major problem with the WECO product was that the "pulse" contact burned rapidly. Both the AECo and WECO products had single contacts on the pulse springs at this time; but the burning problem was restricted to the WECO product. (I suspect this had to do with the trigger pulse.) Thus, WECO introduced the much improved 5-type dial. It, like it's predecessors, had a trigger contact, driven by a series of lobes; but the redesign made for a much better product, which was MUCH quieter: though still not as quiet as the AECo product. AE, not to be outdone, redesigned the basic 24 dial at the same time, and came out with the 24A36. It was quicter than both it's own predecessor, and the WECO #5; thus AECo continued to retain it's lead in rotary dial technology.

North American dial technology changed little until the advent of the 500 series prototype. Manufactured under the Bell Labs' usual "F" code (for field trial), this new dial was introduced in the original "F-" coded 500 set, in (c) 1947. (This is the 500 from which Kellogg copied their original "K-500".) The new F-coded dial was deemed successful, and' coded 7A, it was used in the production of the production of the 500B set, introduced in 1949. Unfortunately, this superb dial was very costly to manufacture, and contributed to the original slow acceptance of the overpriced 500A/B sets. By 1951, a new series of 500 sets had been introduced, and the new 7D dial was incorporated into these telephones. This dial was something less than successful, altho' millions were manufactured. (During the 1950's, Northern Electric entertained a small offshore export business, and one of their customers was the Telephone administration in Israel. Northern landed a large order for 500 sets, subject to one condition: the 7 type dial had to be replaced with AECo's then new 52 type dial. It is interesting to note that AECo manufactured an adapter, coded D-731923-A just for this

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The Rotary Dial

Continued From Page 5

purpose; and the order for Israel was so equipped.

As noted, the AECo product was generally considered superior: so much so that most of the other independent North American manufacturers either standardized the AECo dial in their product, or manufactured an almost carbon copy of the AECo product. Even Northern Electric, before the introduction of the 500 set, offered the AECo dial as a standard alternative in telephones arranged for the 3" dial. (They also offered dials of British manufacture, for technical reasons.) AECo was probably hesitant to redesign a very successful product, but in 1951 they introduced their type 51 dial. The main changes included dual contacts on the spring combinations, and a die-cast housing, replacing the previous stamped case. This dial was used in the initial "manually compensated" 80 and 90 series telephones, with an outside number ring. When the 80 and 90 sets were redesigned for "self compensation" in the late 1950's, a modified 51 type dial, coded 52, and incorporating the number ring as part of the dial, was introduced. This dial was originally equipped with screw terminals, but eventually was replaced with a form of wire-wrap connection, to which the dial leads were soldered.

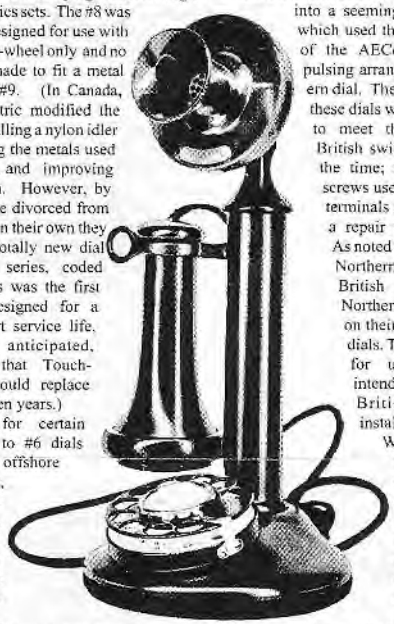
After the introduction of the 500 set, Western introduced the #6 dial (c. 1953). This dial, in standard configuration, had the same spring pileup as the #5 dial that it was intended to replace. The gear train was similar to that of the 7D, but most of the parts were not interchangeable.

(It is interesting to note that after the field trial of the "F-" coded 500 set, the letter "Z" was dropped from the production models. The "Z" was omitted on the second production run of the 7A dial, in the redesigned package. The #164A number plate used on the #6 dial did not have the "Z"; and there was some limited production of 150 type plates, used on the 5-type dial, which also did not have the letter "Z". It was several more years before AECo dropped the "Z" from their 51 type dial [3" version]).

In 1957, WECo introduced for field trial, the "Bedroom Phone". Manufactured under the usual "F-" number, this phone was supplied with a modified (and illuminated) 6-type dial (also manufactured with an "F-" (field trial) code. This dial was not deemed successful, and a new dial, the 8A, was designed; this dial was vastly superior to either the #7 or #6 types; it, too, was designed to be illuminated.

Not to be outdone, AECo designed their version of a Princess, and called it a "Starlite". It, too, had in illuminated dial, (coded type 54)....however, instead of the incandescent lamp used in the Princess, AECo's set was equipped with a electroluminescent ring, which emitted a superb blue green glow around the perimeter of the finger-wheel.

By 1962, feedback from the operating telephone companies indicated to the Bell Labs that maintenance problems with the #7 type dials were much higher than anticipated. Perhaps the Labs foresaw this problem, because many improvements had been incorporated into the #8 dial; and they simply modified this dial by incorporating the 4 1/4" number ring, and modifying the mounting to suit the 500 series sets. The #8 was the first dial designed for use with a plastic finger-wheel only and no attempt was made to fit a metal wheel on the #9. (In Canada, Northern Electric modified the #7 dial by installing a nylon idler gear, changing the metals used in the casting, and improving the lubrication. However, by 1965 they were divorced from Western, and on their own they introduced a totally new dial for the 500 series, coded QDB1A. This was the first rotary dial designed for a relatively short service life, as it was anticipated, prematurely, that Touch-Tone dials would replace rotary within ten years.)



Except for certain modifications to #6 dials manufactured offshore in later years, little change was made in the standard dials after 1966, with one exception: A new dial, coded 10A. The #10 was unique. It was designed specifically to be used in the rotary dial-in-handset Trimline. In order to make the finger-wheel smaller, a patented moving finger-stop was used; and there were no "off-normal" springs. (It was thought that these were not necessary, as the customer had to hold the handset in his/her hand while dialing, and thus the dial clicks, cushioned by the varistor on the receiver unit, would not be objectionable).

AECo introduced a similar dial in their "Style Line" telephone: it was coded type 154, and had off-normal springs! Both the #10 and the #154 dials were arranged to be illuminated, and both manufacturers subsequently used their dials in newly introduced "test sets" for installers and repair persons.

North American dial production came to an end in the early 1980's, as telephone set production was shifted offshore, or came to an end. Rotary dial is still widely used in other countries, however; and a wide variety of dials, incorporating features from North American dials, are in general use. In the 1920's the British redesigned the AECo dial, into a seemingly inferior product, which used the governor principle of the AECo product, and the pulsing arrangement of the Western dial. The interdigital pause of these dials was somewhat longer, to meet the requirements of British switching equipment of the time; and the very small screws used to connect the dial terminals to the dial cord were a repair person's nightmare. As noted earlier in this article, Northern frequently used the British dial, mounted on Northern's "N1G" adapter, on their sets arranged for 3" dials. This dial was supplied for use on telephones intended for use with the British exchanges installed in the Canadian West immediately after WW2 (when, strangely, North American suppliers could not meet the demand for dial central office equipment, and war damaged British plants could). Many collectors, finding these dials on Northern sets in their collection believe them to be a Northern Electric manufactured dial; they are not. Dials of the British type, despite what seems to be a flimsy design, are still manufactured in many countries; and seem to stand up well enough in service.

More About Dials

By Bruce Crawford

Rotary dials are a "loop disconnect" device; as they unwind, they open the loop for each digit dialed; that is, if 4 is dialed, the loop is opened 4 times; circuit arrangements in the exchange prevent a disconnect during this brief "open" period. The normal "break" period is about 62% of the "pulse" interval. Interdigital pause: with older exchange equipment, a pause was necessary between digits, to allow the central office equipment to advance itself. This pause is equal to the time it takes the dial to return to normal after completing the pulsing operation, and is equal to two blanks (see the space between the #1 and the fingerstop). British dials have three blanks in this area; this is because older British equipment required somewhat longer time to function.

Off normal springs: The additional springs on a dial "short" the receiver circuit (except that in earlier WECo dials terminals "W" and "BB" opened the receiver circuit). The off- normals operate when the dial is rotated, to prevent the clicks from being heard by the calling party.

Speed: Except for certain dials intended for use in PBX boards the usual speed for a dial is "10 pulses per second" (or about the time it takes to say 1002) ... that is, the dial, when fully rotated, should take about 1 second to return to normal, when released. So called "high speed" dials (20 pps) can only be used with panel, electronic, crossbar or digital systems; and 10 pps dials MUST be used with (now rare) Step-by-step central office technology.

Dials, Repair, Maintenance

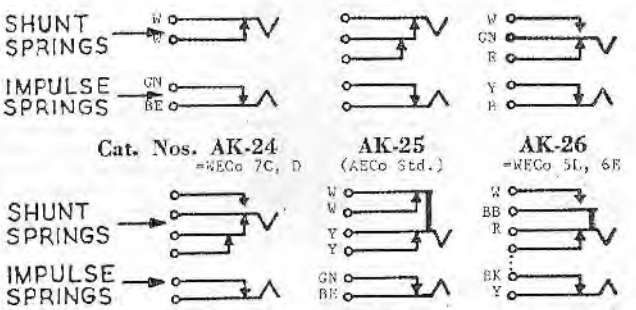
Generally, relatively sophisticated equipment is required for dial repair. GTE practices suggest dismantling the entire dial; this is hardly feasible today. However, ultrasonic cleaning of dials badly gummed or over lubricated is sometimes essential. Unfortunately, the average hobbyist does not have an ultrasonic cleaner or test equipment for dials.

Dial fingerwheels may require special tools to remove them from the shaft; Dr. Meyer's recent book illustrates the removal of the plastic fingerwheel from a standard WECo, NECO, S-C or ITT 500 set; this applies to most plastic fingerwheels manufactured by these firms. AECO's plastic wheels are somewhat different, and, unfortunately, a great variety of assemblies were used by that company over the years. Later AECO 3" fingerwheels were simply screwed on; the mounting screw is hidden by the stick-on dial card. (Replacement labels for the AECO dial just described are available from most stationers. Unfortunately, the clear celluloid that was used to protect the label is not available.) Dr. Meyer's book also illustrates the removal of the metal card holder from the AECO metal fingerwheel; a special tool should be used, but this is rarely available. After the AECO card holder is finally removed from this dial, carefully study the mechanics of same, and reassembly should be relatively easy.

WD-40 can be used to free a seized dial, but its use is NOT recommended. WD-40 is not a permanent lubricant (it eventually evaporates). The manufacturers provide a number of practices on dial lubrication, but it was interesting to note that in Northern Electric's Repair and overhaul shops their own practices were ignored. The dial repair person simply used a toothpick, dipped about 1/4" into a small container of sewing machine oil (3 in 1, for example). Each bearing point is lubricated, with care being taken to see that absolutely NO oil gets into the governor. DO NOT APPLY EXCESS OIL. (At this point, if the dial didn't turn at an approximately close speed, Northern simply junked it! In all fairness, however, it should be pointed out that in 1961, when I was first given a brief tour of Northern's shops, the cost of labor had reached a point that many units of equipment were classed as "Beyond Economical Repair" (BER) with emphasis on the economical part. What really surprised me, however, is that there was no equipment to test the speed of the dial, or the make-break ratio: and remember, NECO was rebuilding hundreds of thousands of phones for Bell of Canada, at this time!)

Assuming the dial rotates, the speed can be adjusted. The governor on the AECO style of dial is easiest to work on; if the dial is running slow simply bend the governor springs in slightly (a little at a time!) ... likewise, if running fast, vice versa. Nmbrs. 2, 4 and 5 type dials have a small screw in the governor case; loosen the screw and adjust the little dial to the left or right to adjust the speed; then retighten the screw. Late model WECo design dials are not as readily adjusted. It is necessary to remove the spring that holds the weights (on the governor) and open or close the arc, slightly; this may prove near impossible in some cases.

The shunt springs on a dial are best checked with a buzzer. An ohmmeter does not draw adequate current, and marginal off-normal contacts may test OK. With a buzzer and battery connected to (for example) the white leads of a #7D dial, the buzzer should buzz with the dial turned less than 50% of the diameter of the finger holes.



Dial Spring Assemblies

Designations on WECo product, only.

(Shunt springs shown in off-normal position)

(*When strapped as shown by dotted connection)

If a dial dials wrong numbers, it generally means that too many pulses are being sent. It is important on 6, 7 and similar dials that the pulsing cam is on the correct angle: compare with a known good unit. On AECO dials, the location of the cam that operates the "blanking" spring is all important; an AECO dial actually pulses one additional pulse, but this last pulse is supposed to be shunted by the blanking spring. With an electronic switching center, the slightest interruption is counted as a pulse; thus the blanking spring must be accurately adjusted.

There are so many "large" rotary dials available today, that perhaps substitution is the easiest way to go. However, 3" dials are now somewhat rarer; thus the time to repair same might be well spent. If a dial is sent out to a professional firm for rebuilding, and you pay less than $20.00 per dial, it is not being done professionally! Dials are no longer repaired/rebuilt on a production basis, and, including rebuilding, repainting, repair and accurate calibration, a minimum of 40 minutes is usually required.

Do NOT lubricate nylon bearing points on the newer dials; the nylon is the lubricant.

If you have some technical knowledge you can substitute dials with different spring combinations, in various manufacturer's circuits. Unfortunately, the circuits provided in Dr. Meyer's book are not as clear as I would liked to have seen; note that the dial off-normal contacts, are for example, often detached from the dial. However, with careful study, and by comparison of the various circuits that Dr. Meyer has used for illustrative purposes, you may be able to use different dials in different circuits.

The spring combinations diagram shown in conjunction with this article, are from one of AECO's industrial catalogues; they made a great deal more for various purposes; however, those shown apply to most manufacturers' circuits. NOTE THAT THESE COMBINATIONS ARE SHOWN WITH THE DIAL ROTATED "OFF NORMAL".