May 15, 1962 R. A. EGBERT 3,035,256

REMOTE FREQUENCY INDICATOR

Filed Feb. 2, 1960

Fig. 1

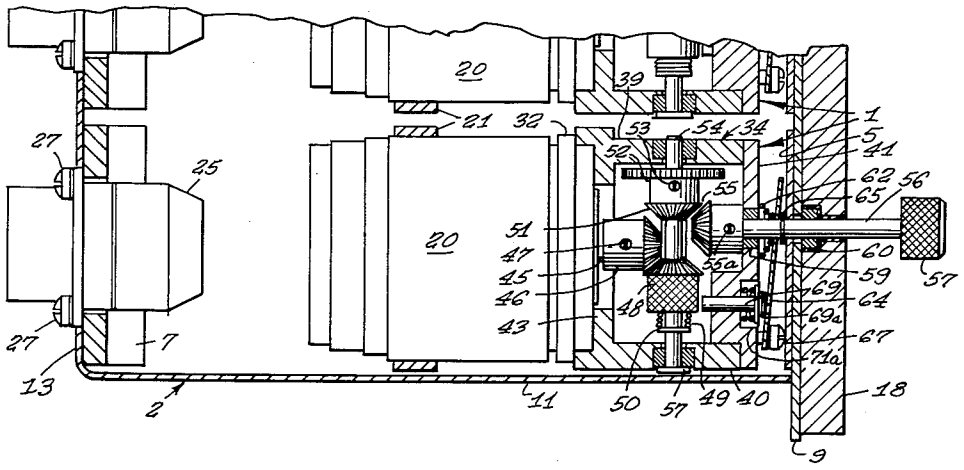


Fig. 2

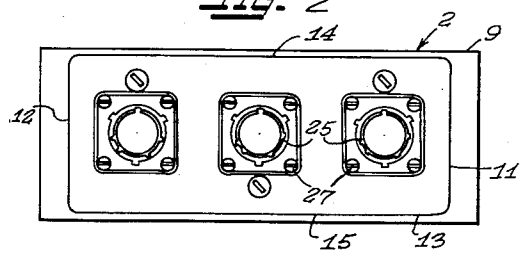


Fig. 3

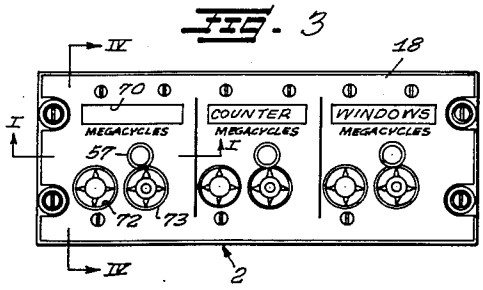
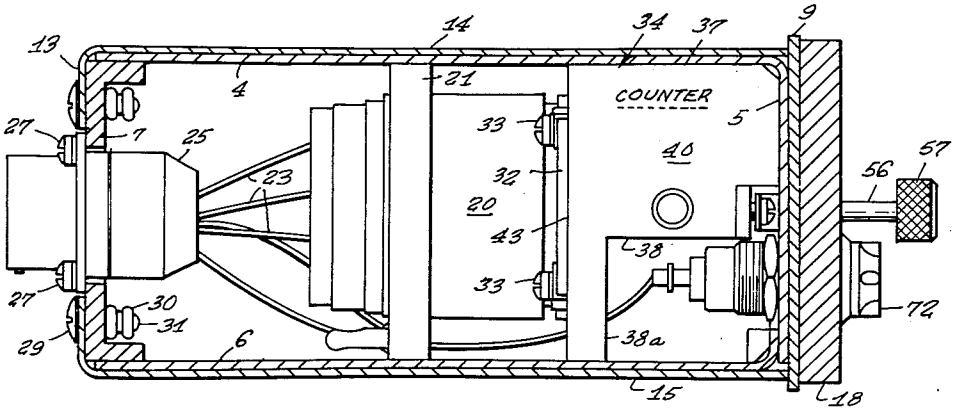


Fig. 4



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REMOTE FREQUENCY INDICATOR

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This invention relates to an indicator, for use at a master or control station, to visually show the exact numerical frequency of a remote, connected tuner receiver or the like. More particularly this invention relates to such a remote frequency indicator of the type having a selsyn electric motor controlled, and moving in accordance with, a transmitter corresponding to the frequency of a remote tuner or the like, said selsyn being operatively connected to drive a counter which always supplies a visible, numerical indicia of the frequency of the corresponding and connected remote tuner, and said indicator including manually operably reset means to synchronize the counter indicator with the frequency of the remote tuner when necessary.

The general objects of this invention reside in the provision of an improved remote and manually resettable frequency indicator, of this type which is small and light to be suitable for airborne use and yet is reliable, stable, trouble free and convenient in its normal and in its reset operation or use.

A further object of this invention is the provision of such an indicator, including as an operative part thereof, an improved and manually adjustable reset means to permit periodic synchronization of the counter with the frequency of the remote tuner without in any way disturbing or moving the selsyn repeater motor during such manual adjustment.

Another and more detailed object of this invention is the provision of such an indicator including a drive permitting a slip clutch actuation of the counter to synchronize it with the frequency of the remote tuner only when necessary by a special and foolproof manual motion of the rotary reset shaft to thereby prevent angular motion of the selsyn motor only during the actual interval of such manual adjustment.

This invention contemplates other objects, features and advantages which will become more fully apparent from the following detailed description taken in conjunction with the accompanying drawings which illustrate a preferred embodiment, and in which:

FIGURE 1 is a sectional view taken on the line I—I of FIGURE 3, with certain interior parts shown in full;

FIGURE 2 is a reduced scale, rear elevational view of an assembly unit or set of three of the indicators corresponding to this invention;

FIGURE 3 is a front elevational view of the assembly as shown in FIGURE 2; and

FIGURE 4 is a scale, sectional view taken on the line IV—IV of FIGURE 3, and with certain interior parts shown in full.

The separate and preferably identical selsyn actuated, frequency indicating units, each designated as a whole by numeral **1**, are particularly intended to be used in assemblies or sets of a plurality, or up to three, mounted as shown in a single or common case or box, which is designated as a whole by **2**. A desired or suitable number of such assemblies or boxes (which may, for example, give a total of nine indicator units) are suitably mounted, as on the front of the counter measure system console or control panel in an airplane, with each case **2**, extending across the width of such panel or console.

Such group of sets of units permits visual monitoring or observing of the frequency of each of a plurality of remote but suitably connected stations, or the tuners of

remote receivers of a system (such as a counter-measures system) having a plurality of remote and periodically differently tuned, counter-measures receivers. These remote receivers are each to be tuned from the same master station by suitable or conventional but non-illustrated means. Each indicator unit **1** is suitably connected to be energized by, and to respond to, its corresponding remote selsyn transmitter at the tuner of the corresponding remote receiver. Such operative connections and such remote receiver-tuner controls are not further described or illustrated herein since they may be of any suitable or known type and are well understood by those skilled in this art.

Thus, according to the system and the units of the present invention, the system operator can instantly, and without having to reset any counter as he switches from tuner to tuner, visually observe the current or existing frequency of each of the plurality of the remote receivers of the system.

It is to be noted that heretofore a single or only one larger and heavier (and less efficient) remote receiver indicating unit and counter was employed for all of the plurality of receivers or tuners in the system. This required that the operator had to reset this single (larger and heavier) indicator each time he changed the tuning range. This took, relatively, a substantial period of time, as much as two minutes.

In contrast to the foregoing, the present system (by reason of the smaller and lighter indicator units of which an appreciable number, such as the above mentioned nine, can be airborne) eliminates this time consuming and error producing resetting operation for the reading of each station and permits the operator to instantly read the tuning of any one of the remote stations or receivers. The reset means need only be employed when necessary or when a remote receiver is out of synchronism with its selsyn connected indicator. Thus, according to the present invention, the operator normally has no need to reset any counter, as he switches from tuner to tuner.

Each indicator, according to this invention, forms a complete and self-contained unit, having its own frame or its own partial case comprising the top **4**, which may, as shown, be formed integrally by bending with the front closure **5** and preferably of thin metal which in this embodiment, is anodized aluminum. This frame or partial casing also includes the suitably secured and thicker insulating, rear closure **7**, and if desired, the suitably secured bottom **6**, which is preferably also of anodized aluminum. While it is not essential when units **1** are mounted in the assembly boxes **2**, yet it will be understood that each unit **1**, may if desired, be completely encased.

A plurality of such indicator units, preferably up to three as shown, are suitably mounted and secured in a set or assembly, case **2** which comprises the front **9**, the sides **11** and **12**, the back **13**, the top **14** and the bottom **15**, all suitably secured together and all preferably of anodized aluminum.

A suitable, translucent and edge-lit front or display panel **18** is suitably secured to the front closure **9** and carries suitable markings and the several actuating knobs or controls thereon as shown in FIGURE 2. As noted above, a plurality of such three unit wide assemblies **2** may be mounted one on top of the other for all or part of the height of the suitable control console.

A selsyn motor **20** is suitably mounted, as by the embracing strap **21** which is in turn suitably secured to the casing top, and if desired, to the casing bottom **6** as indicated in FIGURE 4. The details or interior of the selsyn **20** are not further disclosed or illustrated herein since any known or suitable type may be employed, as will be well understood by those skilled in this art.

This selsyn motor **20** is suitably energized and controlled, as by wires **23** extending from the connector plug **25**. This plug extends outwardly through corresponding holes in the rear walls **7** and **13** and is suitably secured to wall **7**, as by screws **27**. It will be noted that walls **13** and **7** may be secured together as by suitable rivets **29** having inner head means **31** compressing springs, such as **30**, between them and the wall **7** to thereby provide vibration absorption and to take up all clearance in the securing together of several units **1** to common wall **13**.

The front end of the selsyn motor **20** is suitably secured to the rear of the gear casing which is designated as a whole by **34** and encloses for both the counter and the gear drive. This securing or mounting may be by means of an outwardly extending flange **32** on the front of the cylindrical casing of the selsyn motor **20** connected by screws **33** to the rear end portion **43** of the drive and counter casing **34**.

This casing **34** comprises the side walls **39** and **40** which may, if desired, be formed integral with the rear wall **43**, the front wall **41**, the top wall **37**, and bottom wall **38**, are all suitably connected and of suitably rigid and light material. The bottom wall **38** has a downwardly extending leg or extension **38A** to engage the bottom wall **6**.

The selsyn motor has its rotary shaft **45** projecting from its front and engaged in a corresponding socket, in which it is secured by set screw **47**, of the sleeve and bevel gear member **46**. Gear **46** is always meshed with bevel gear and sleeve **48**, which has a friction drive or slip clutch type of connection to its drive shaft **54** by means of the friction producing, compression spring **49** which engages its end, said spring being held in place by the locking ring **50**. Thus spring **49** also holds gear **46** in mesh with gear **48**.

Also mounted on the other end portion of drive shaft **54** is the additional bevel gear **51** rigidly connected to spur gear **52** which is, in turn, rigidly mounted on shaft **54** as by the set screw **53**. The bevel gear and sleeve **55** is normally free from, or out of engagement with, gear **51**. Gear **55** is suitably and rigidly mounted, as by set screw **55***a*, on the rotary and axially reciprocable plunger element or shaft **56** which has the actuating knob **57** rigidly mounted on its exposed or outer end.

The shaft and plunger **56** extends through suitable holes in the several front walls, including the seal and bearing **60** in wall **18** and the seal and bearing member **59** in wall **41**.

This plunger-shaft **56** is held in its outer, or disengaged, position, as shown, by the conical spring **62** which is compressed between front wall **41** of the casing **34** and suitable means secured to the plunger shaft **56** such as the leaf spring lever **64** which is secured to the shaft to permit the shaft to extend through, and to rotate in, a hole in this lever. Axial motion of the shaft relative to lever **64** is prevented by the retaining ring **65** fixed on the shaft and engaging lever **64** as shown. The inner or fixed end of the lever or leaf spring **64** is suitably secured on casing **34** as by the screw **67** through a hole in the inner end of spring lever **64**. It will be noted that the spring lever **64** also engages, intermediate its length, a plunger **69** which is reciprocably slidable in a suitable hole through the front wall **41** of the casing **34** so that its inner end can engage the knurled cylindrical surface of the gear and sleeve member **48** to serve as a brake to hold or lock member **48** against rotary motion (through its slip clutch connection by **49** to the shaft **54**) when the plunger-shaft **56—57** is pushed into its operative position against the compression spring **62** and the springiness of **64**.

When it does become necessary to reset the angular position of the counter mechanism is adjusted, relative to motor **20**, by rotation of gear **51** and connected spur gear **52**, which connects to the input or unit end of any suitable or conventional indicating type of counter stack

mechanism such as the Veeder-Root unit which is well known to those skilled in this art and hence not further illustrated herein.

Thus, during this occasional reset operation, pushing in of plunger and rotary shaft **56** simultaneously brakes or locks **48** (and hence the selsyn motor) against any angular motion and simultaneously permits the reset adjustment of the counter by rotation of shaft **56** through the clutched or meshed in gear **55**, which then engages with gear **51**.

It may be noted that gears **46**, **48**, **51** and **55** may be of various conventional types but are here illustrated as bevel or miter gears having angles of 45°. It is also to be noted that spring **49** not only serves as the friction drive or slip clutch, but it furnishes the resilient bias to maintain gear **48** in meshing and operative engagement with gear **46**. It will also be noted that **57** may be considered as a push button, which when pushed in locks up the selsyn motor **20** and engages the counter drive gear unit **51** to rotate the same upon rotation of the button or knob **57**. If button or knob **57** is rotated without being pushed in, there will be no effect, so that these controls are foolproof in preventing improper actuation.

The brake plunger **69** is slidably mounted in a suitable hole in the gear drive casing front **41** and has its enlarged head engaging under the spring lever **64**. This same head **69A** engages, and is outwardly biased by the compression spring **71**, which is seated and retained in a suitable recess **71A** in front **41**. It is to be noted that spring **71** normally holds the inner or brake end of plunger out of engagement with the knurled periphery of gear sleeve **48**. This spring **71** and spring **62** (and the springiness of lever **64**) cooperate in holding the whole unit in its operative position.

The translucent front panel **18** has a counter window or opening **70** through which the indicating numerals on the wheels of the horizontal axis counter stack are visible. Knob **72** may be used to control the normal panel lighting and knob **73** to control the edge lighting of **18**.

It is to be understood that various modifications or changes may be made without departing from the spirit or scope of this invention as defined in the appended claims.

I claim as my invention:

1. A remote receiver frequency indicating unit for a multiple-receiver radio system comprising a selsyn electric motor having means to operatively connect it to said remote station, a rotary counter to visually indicate frequency, drive means connected therebetween including bevel gears connecting said motor to a transverse drive shaft through spring held, friction, slip clutch means, said shaft being connected to drive said indicator and having an additional bevel gear thereon, normally inoperative brake means to hold said motor against rotation, and an axially movable and rotatable, manually operable, reset shaft extending transverse to said connecting shaft and substantially parallel to said motor, a spring biased lever urging said shaft axially towards its inoperative position and also engaging said brake means to actuate it upon axial motion of said reset shaft into its operative position, and a bevel gear upon the inner end of said reset shaft to be meshed with said additional bevel gear upon said axial motion of said reset shaft into its operative position to thereby rotate said indicator in either direction upon rotation of said reset shaft while so engaged.

2. A remote radio receiver frequency indicator unit comprising a unit frame forming at least a partial box-like casing which is elongated from front to back, a selsyn electric motor centrally therein and having a shaft extending axially of the length of said frame, means in the rear of said frame to operatively connect said motor to a remote receiver, a transversely extending and visible counter indicator in the front of said frame and having a connected drive shaft extending transversely to said motor, a bevel gear on said motor shaft, a meshing bevel

gear having connected brake means and being on said transverse drive shaft and connected thereto by a friction slip clutch, an additional bevel gear on said drive shaft, and an axially extending and movable reset shaft having a bevel gear thereon normally held disengaged from said additional bevel gear with said additional bevel gear and to simultaneously engage and actuate said brake means to hold said motor against rotation by slippage of said clutch, to thereby permit rotation of said counter in either direction relative to said motor.

3. A retote station frequency indicating unit comprising a case having a front with a window opening therein, a counter stack indicator in said case and having numerals visible through said window opening, a selsyn electric motor in said case and having means to operatively connect it to said remote station, drive means normally interconnecting said motor and said indicator and including clutch and brake means, manually operable means extending into said casing and connected to reset said indicator by simultaneously holding said motor against rotation by said brake means to permit slippage of said clutch means to thus prevent motor rotation by one motion of said manually operable means and means manually engaged by said manually operable means while so held to angularly move said indicator in either direction upon another motion of said manually operable means, and resilient means to normally hold said manually operable means in its inoperative position and said drive means in its operative position.

4. A remote receiver frequency indicator unit comprising a case having a front with a window opening therethrough, a rotary counter stack indicator means therein having its frequency indicating numerals visible through said window, a selsyn electric motor in said case, drive means connecting said motor and said counter means and including a normally engaged slip clutch means, a brake means to hold said motor, and manually operable reset means to shift the angular relation between said counter means and said motor to reset said indicator means to the then receiver frequency comprising means including a shaft extending transversely through said casing front to engage said brake means to hold said motor and permit slippage of said clutch means upon axial motion of said reset shaft and to angularly move said counter means in either direction relative to said motor upon rotation of said reset shaft while it is engaging said brake means.

5. A remote radio receiver frequency indicating unit comprising a case having a visible and reversibly rotatable frequency indicator therein, a selsyn electric motor in said case having a shaft and having means to operatively connect it to said remote station, drive means normally interconnecting said motor shaft and said indicator and including a drive shaft extending transversely to, and connected to, said motor shaft, said drive shaft having slip clutch means and brake means thereon, and reset means including a plunger shaft adjacent to, and substantially parallel to, said motor shaft, spring means to hold said shaft in its outer inoperative position, said shaft being axially movable inwardly to engage said brake means and hold said motor to permit slippage of said clutch means, and said shaft including means to rotatably actuate said indicator in either direction when said shaft is in its inner operaive position.

6. A remote frequency indicator unit comprising a reversable selsyn electric motor having a shaft, an axially extending drive and indicator casing connected to the end of said motor and enclosing its shaft, a visible and reversibly rotatable indicator in said casing, drive means in said casing normally operatively connecting said motor shaft and said indicator, said drive means including a drive shaft journaled at each end in said casing and extending transverse to, and operably connected to, said motor shaft and having slip clutch means and brake means thereon, manual reset means including a shaft plunger

journaled in said casing for axial motion and rotary motion, a compression coil spring acting between said casing and said shaft to normally hold it in its axially outer and inoperative position, a lever engaged by said spring and said shaft plunger to actuate said brake means and permit slippage of said clutch means when said plunger is held manually in its inner operative position, and gear means engaged when said plunger is in its inner operative position to angularly adjust said indicator in either direction relative to said motor.

7. A remote radio station frequency indicating unit comprising a selsyn electric motor having means to operatively connect it to said remote station and having a shaft, a reversibly rotatable frequency indicator, drive means normally interconnecting said motor shaft and said indicator, a drive and indicator casing extending from, and connected to, said motor and enclosing its shaft and enclosing said drive means and said indicator, said drive means including a drive shaft extending transverse to, and operatively connected to, said motor shaft and having slip clutch means and a brake means thereon, manual reset means including an axially reciprocable brake plunger slidably mounted in said casing and having spring means to hold it in its inoperative position, said brake plunger being positioned to operatively engage said brake means, and reset means including a shaft plunger journaled in said casing for axial and for rotary motion and having a compression spring acting between said casing and said shaft to normally hold it in its inoperative outer position, a lever pivotally mounted on the outside of said casing, engaging said brake plunger and engaging, and actuated by, said shaft plunger whereby said shaft, when held in its inner operative position, actuates said brake to permit slippage of said clutch upon rotation of said indicator relative to said motor, and means engaged upon axial motion of said plunger shaft to its inner position to angularly adjust said indicator.

8. An indicator unit to visually show the frequency of a remote radio receiver comprising a selsyn motor having means to operatively connect it to said remote receiver and a shaft, a drive and indicator casing connected to the end of said motor and enclosing said motor shaft, a visible and rotary frequency indicator in said casing, drive means in said casing normally operatively connecting said motor shaft and said indicator, said drive means including a transverse drive shaft and a pair of bevel gears interconnecting said motor shaft and said drive shaft, spring means providing a slip clutch and also holding one of said bevel gears in meshing engagement with the other of said bevel gears, one of said bevel gears having means providing a brake to hold said motor, and manually operable, reset means to actuate said brake means and permit slippage of said clutch means, said manually reset means including means to rotate said indicator in either direction relative to said motor.

9. A remote receiver frequency indicator unit comprising a rotary frequency indicator, a selsyn electric motor, drive means between said indicator and said motor including a normally engaged slip clutch means, a brake means to hold said motor, and a unitary manually operable reset means movable in one direction to actuate said brake means to permit slippage of said clutch means and simultaneously movable in another direction for actuating said rotary indicator independently of said motor by said slippage of said clutch means.

References Cited in the file of this patent

UNITED STATES PATENTS

1,375,437	Akemann	Apr. 19, 1921
2,750,585	Anderson et al.	June 12, 1956

FOREIGN PATENTS

793,869	France	Feb. 3, 1956