

July 4, 1933.

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1,917,008

TIMING MECHANISM

Filed April 30, 1930

2 Sheets-Sheet 1

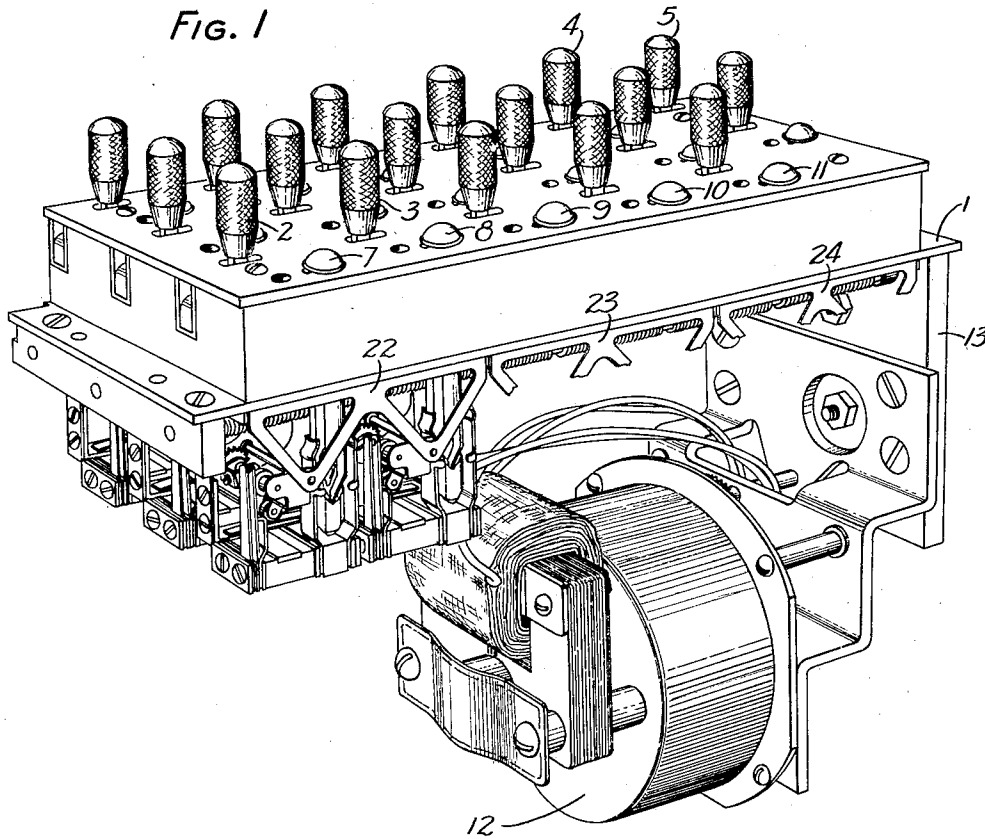


FIG. 5

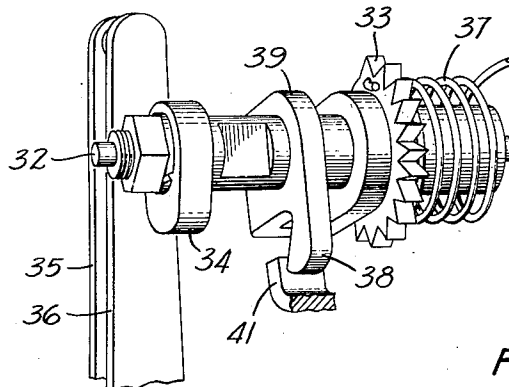
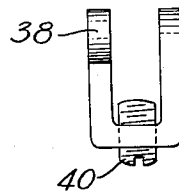


FIG. 6



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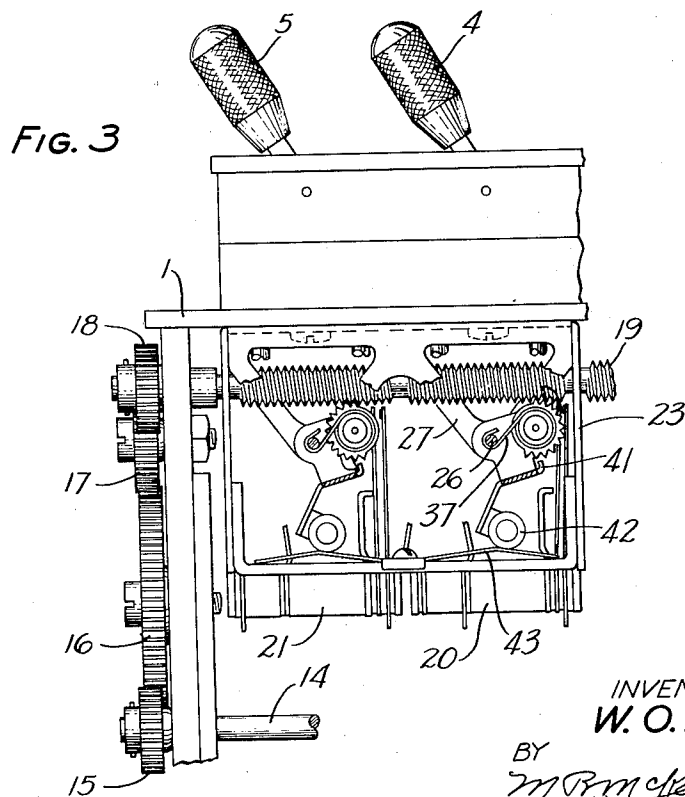
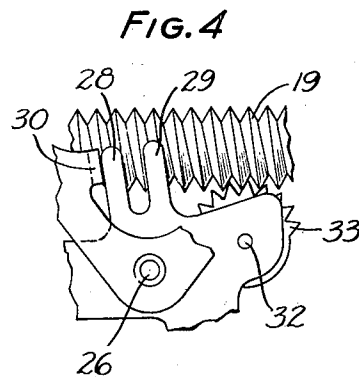
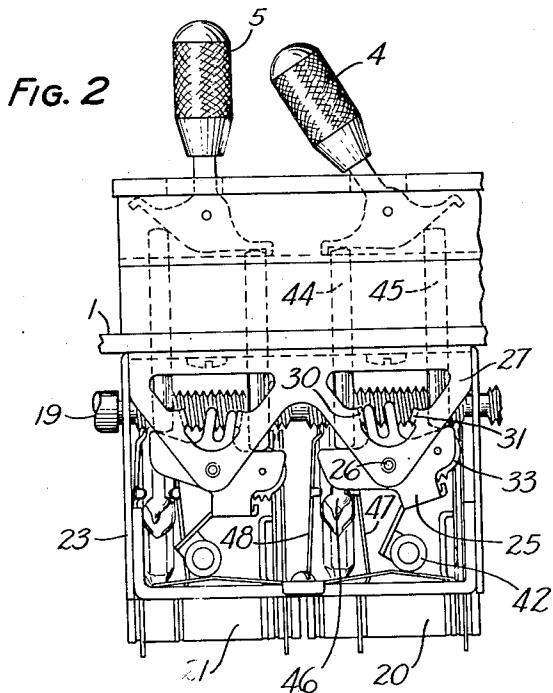
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TIMING MECHANISM

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2 Sheets-Sheet 2



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TIMING MECHANISM

Application filed April 30, 1930. Serial No. 443,508.

This invention relates to timing mechanisms and particularly to devices of this character used for measuring intervals of conversation in telephone systems.

The objects are to simplify the construction and operation of timing devices, to conserve the space required for mounting them, and to secure other improvements therein.

According to this invention, a device is provided for timing the calls at an operator's position which consists of a constantly driven shaft and a plurality of timing units each individual to an operator's cord circuit. These timing units are mounted below the operator's keyshelf, and each one includes a supporting cradle pivoted to oscillate between two extreme positions and carrying a rotatable timing shaft having a gear wheel thereon which engages the driving shaft when the operator's key is thrown to rock the cradle to one of its extreme positions. The timing shaft carries a cam that actuates a set of contacts after the shaft has been driven through a predetermined distance to measure an interval of time, such as a five minute period, and the contacts close a circuit to light a lamp, advising the operator that the period of time has elapsed. The timing shaft also has a spring thereon for restoring it to normal as soon as the operator throws the key in the opposite direction to rock the cradle to its other extreme position disengaging the timing element from the driving shaft.

According to a feature of the invention, the rocking cradle, which carries the timing shaft, is provided with stop fingers coacting with stop members on the frame to limit the degree to which the timing gear wheel can mesh with the thread on the driving shaft. The purpose of this is to insure that the gear teeth do not mesh too deeply, thus avoiding unnecessary friction.

According to a further feature, the timing units, including the cradles and other elements, are mounted in pairs in a housing member attachable to the lower side of the keyshelf.

The invention is illustrated in the drawings in which

Fig. 1 is a perspective view showing a portion of an operator's keyboard and a number of timing units mounted thereon and also a driving motor;

Fig. 2 shows two of the timing units together with the actuating keys;

Fig. 3 is another view of two of the timing units also showing the driving elements;

Fig. 4 is a detail illustrating the manner in which the driven timing unit engages the driving shaft; and

Figs. 5 and 6 are details of one of the timing units.

As hereinbefore mentioned, the timing units may be made individual to the respective cords at an operator's position and serve to measure intervals of conversation and to light lamps at the end of the measured intervals to attract the operator's attention. These units are mounted beneath the keyshelf at some convenient location and before the operator and are provided with individual keys such as keys 2, 3, 4, 5, etc. Lamp caps are also provided in the surface of the keyboard 1. These caps, such as the caps 7, 8, 9, 10, 11, etc. are individual respectively to the keys adjacent to which they are located and indicate to the operator the illuminated condition of the associated lamps, which are mounted with the timing units beneath the keyshelf.

A driving motor 12, which furnishes the operating power, is also mounted on a supporting member 13 at some convenient position beneath the keyshelf. The motor 12 drives a shaft 14 and pinion 15, and, through gear wheels including the wheels 16, 17 and 18, operates a plurality of worm driving shafts such as the shaft 19. The speed of the motor 12 is maintained at a constant value so that the rotation of the driving shaft 19 through a given number of revolutions may be taken as an accurate measure of a given interval of time.

The timing units are mounted in pairs on the under side of the keyshelf 1. The two units 20 and 21, for example, shown in Figs. 2 and 3 are mounted together in the U-shaped housing member 23. The housing member 23 is secured to the keyshelf 1 by means of

screws. By removing the screws, the housing member 23 and the two timing elements 20 and 21 may be removed as a unit from the structure. Referring to Fig. 1, three of these housing members 22, 23 and 24 are partly illustrated on the front side of the structure, and two other rows each consisting of three housing members are attached to the keyshelf along the middle and rear side of the structure.

The individual timing unit comprises a cradle 25, which is mounted on a spindle 26 between two opposing brackets 27 on the housing member 23. The cradle 25 may be rocked about the spindle 26 between two extreme positions. These positions are determined by the stop fingers 28 and 29 on the cradle, which engage respectively the stop pieces 30 and 31 on the bracket 27 of the housing 23. The cradle 25 carries a timing element shown in detail in Figs. 5 and 6. This element comprises a shaft 32 supported for rotation between opposite sides of the cradle 25. A wheel 33 having gear teeth formed around a substantial portion of its periphery is securely mounted on the shaft 32 for rotation therewith. A cam 34 is secured to the shaft 32 and serves to close the circuit contact springs 35 and 36 when the timing shaft 32 has rotated through a predetermined distance. A retractile spring 37 having one end secured to the gear wheel 33 and the other end to the spindle 26 serves to restore the timing shaft 32 to its normal position when released. The normal position of the timing shaft 32 is determined by the stop finger 38 on the clevis 39, which is adjustably secured on the shaft 32 by means of a set screw 40 illustrated in Fig. 6. The stop finger 38 engages the projection 41 on the cradle 25 when the timing shaft 32 has reached its normal position.

The cradle 25 is positively held in either one of its extreme positions by means of a roller 42 which engages a V-shaped spring 43. With the cradle tilted to one extreme position, the roller rests on one side of the apex of the spring and is held against movement by the tension of the spring. With the cradle tilted to the other extreme position the roller passes to the other side of the apex of the spring and the cradle is positively held in that position.

The cradle is rocked from one position to the other by means of the plunger pins 44 and 45. These pins engage the upper surfaces of the cradle 25 on opposite sides of the spindle 26 as is clearly seen in Fig. 2. With the pins in the relative positions shown at the left of Fig. 2, the cradle is tilted to the right and the timing gear 33 is out of engagement with the worm driving shaft 19. This is the normal position of the device. When the key, such as key 4, is thrown to its set position as illustrated at the right of Fig. 2, the

plunger pin 44 is urged downward to rotate the cradle 25 to the left. The rotation of the cradle to the left moves the plunger pin 45 upward. With the cradle in its rotated position, the timing gear 33 meshes with the teeth in the worm shaft 19 and the timing shaft 32 commences to rotate.

In order to avoid friction between the worm shaft and the timing gear 33, the device is so constructed that the engagement between these parts may be adjusted. By adjusting the stop finger 28, which has a certain amount of flexibility, the gear wheel 33 may be made to engage the worm wheel 19 in such a way that the points of the teeth on the wheel 33 do not enter fully into the valleys between the adjacent threads on the worm shaft. This insures a smooth driving relation between the shaft and the timing unit.

Each of the timing units is also equipped with an electric lamp which is lighted in a circuit closed by the cam 34 after the timing shaft 32 has rotated through a predetermined distance. The lamp 46, for example, is individual to the unit 20 and is held in place by the contact springs 47 and 48.

The operation of the device will now be described briefly. When the operator sets up a connection between two subscribers' lines, she throws a key, such as the key 4 individual to the cord circuit employed, to the position shown in Fig. 2. This tilts the cradle 25 and engages the gear wheel 33 with the worm driving wheel 19. The timing shaft 32 commences to rotate against the tension of the retractile spring 37. After a definite interval has expired, such as a five-minute period, the timing shaft 32 will have rotated to a position where the cam 34 closes the contacts 35 and 36 to light the signal lamp 46. The operator observes the lighted lamp cap and knows that five minutes have expired since the connection was established. She thereupon takes such steps as may be necessary for charging the subscriber. She also releases the device by throwing the key back to its normal position. This disengages the gear wheel 33 from the shaft 19 and permits the retractile spring 37 to restore the timing shaft.

Should the operator neglect to release the timing unit as soon as the lamp has lighted, the shaft 32 will rotate a little further to a point where the last tooth on the wheel 33 passes over the worm shaft 19. This prevents the device from being injured by the failure of the operator to restore it after it has moved to its extreme position.

What is claimed is:

1. In combination, a driving member, a cradle pivoted to rock between two extreme positions, a rotatable shaft supported by the cradle and movable bodily by the rocking action thereof, a driven wheel secured to said shaft, a plunger for rocking said cradle into

one of its extreme positions to bring said wheel into engagement with said driving member, a set of circuit controlling contacts, a device on said shaft rotatable therewith to actuate said contacts when the shaft has rotated through a predetermined distance, a second plunger for rocking said cradle in the opposite direction to disengage said driven wheel, and means for restoring said shaft to its normal position.

2. In combination, a driving shaft, a cradle pivoted to rock between two extreme positions, a rotatable timing shaft supported by the cradle and movable bodily by the rocking action thereof, a wheel secured to said timing shaft, a plunger element bearing against said cradle and serving to rock it to one of its extreme positions to engage said wheel with the driving shaft, a set of circuit controlling contacts, means carried by said timing shaft for engaging and operating said contacts when said shaft has rotated through a predetermined distance, a second reciprocating plunger bearing against said cradle serving to rock the same in the opposite direction to disengage said wheel from the driving shaft, and a spring interconnecting the timing shaft and said cradle for restoring the timing shaft to its normal rotary position.

3. The combination in a timing device of a constantly operating driving shaft, a supporting member arranged to be rocked between two opposite positions, a rotatable timing shaft carried by said supporting member and movable bodily therewith, a gear wheel on said timing shaft, a reciprocating plunger engaging said supporting member and serving to rock the same to one of its positions to engage the gear wheel with said driving shaft, a set of circuit contacts, a cam on said driving shaft for operating said contacts when said timing shaft has been rotating for a predetermined length of time, a second reciprocating plunger bearing on said supporting member and serving to restore the same to its other position to disengage the gear wheel from said driving shaft, means for actuating said plunger elements, and means for restoring the timing shaft to its normal rotary position when released by the disengagement of said gear wheel.

4. The combination in a timing device of a constantly operating driving shaft having a worm gear thereon, an oscillating supporting member arranged to be rocked between two opposite positions, a rotatable timing shaft carried by said supporting member and movable bodily with the rocking action thereof, a wheel secured to said shaft and having gear teeth cut along a portion of its periphery, a plunger element for rocking said supporting member to one of its positions to engage the gear teeth of said wheel with the worm gear on the driving shaft, a cam secured to said timing shaft, means actuated by said cam when the timing shaft has rotated to a certain position, a second plunger element for rocking said supporting member to its opposite position to disengage the gear teeth of said wheel from the driven gear from the driving shaft, a key for actuating said plunger elements in a reciprocating motion, and means for restoring the timing shaft to its normal rotary position when released by the disengagement of said wheel from the driving shaft.

5. The combination in a timing device of a constantly operating driving shaft having gear teeth thereon, a cradle pivoted to rock between extreme partitions, a rotatable timing shaft supported by said cradle and movable bodily with the rocking action of said cradle, a wheel secured to said timing shaft having gear teeth cut along a portion of its periphery, means for rocking said cradle to engage the gear teeth of said wheel with the gear teeth of the driving shaft, a cam mounted on said timing shaft, contact members operated by said cam when said timing shaft has been rotated for a certain period of time, means for limiting the amount of rocking motion that can be imparted to said cradle to secure a proper engagement between the teeth of said wheel with the teeth of the driving shaft, and means for restoring said timing shaft to its normal rotary position when released by the disengagement of the teeth of said wheel from the teeth of the driving shaft.

In witness whereof, I hereunto subscribe my name this 10th day of April, 1930.

WILLIAM O. BECK.