April 18, 1961 R. E. CROOKE 2,980,326

COUNTER SPEED LIMITER

Filed Aug. 21, 1957

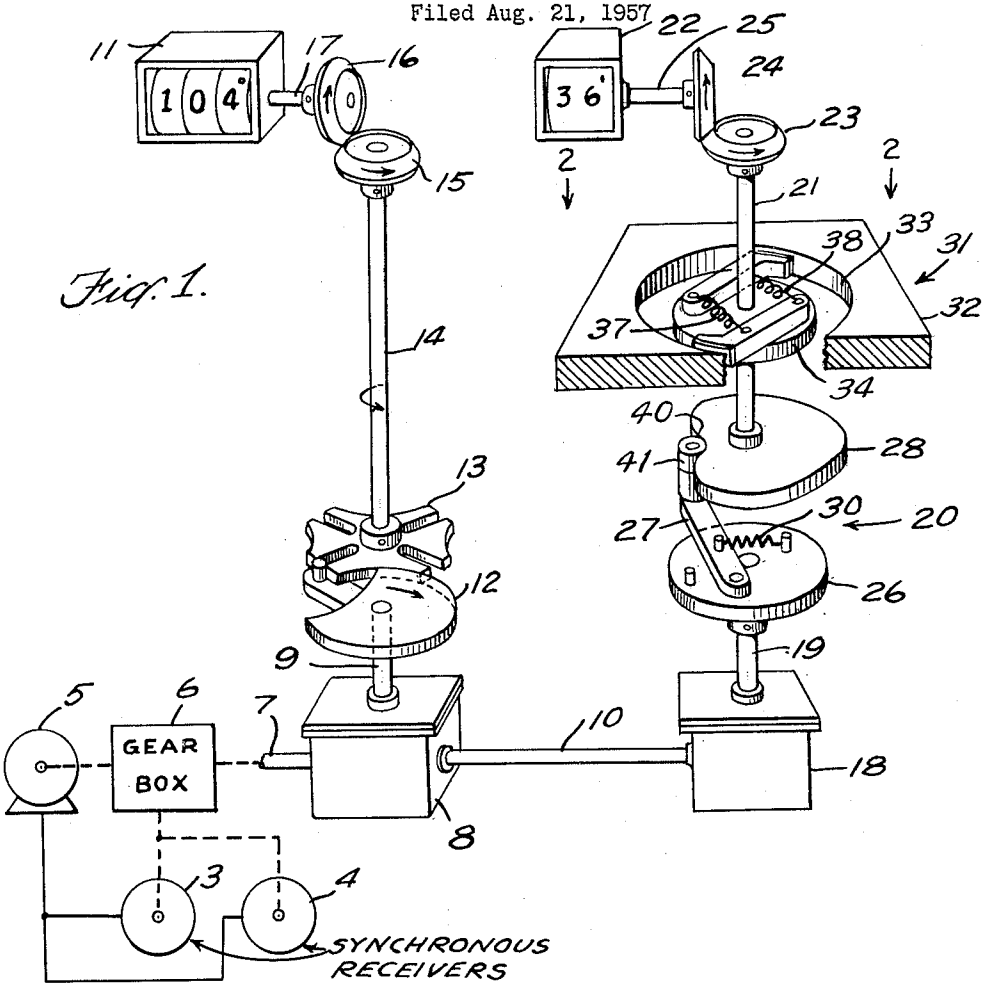


Fig. 1.

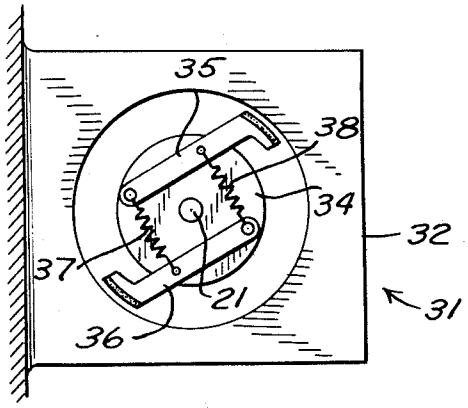


Fig. 2.

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COUNTER SPEED LIMITER

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8 Claims. (Cl. 235—91)

This invention relates to indicator drive systems and particularly to indicator systems employing high and low speed driving mechanism.

In the present stage of the computer art relating to longitude and/or latitude high speed computers efforts to synchronize or reset fine reading counters at high speed due to rapid slewing results in such a high speed of the minutes drums that mechanical failure and breakdown is likely to occur. This is especially true of the modern high speed computers in which the minute drums in present counters would be required to run in the neighborhood of 32,400 r.p.m.

Accordingly, this invention provides an indicating system in which the degrees and minutes drums of a counting mechanism are actuated in such a manner that the minutes drum will not be driven above a given speed but will be driven in proper relation to the degrees drum below said given speed.

Other advantages and features of the indicator mechanism may be appreciated on reading the following description in conjunction with the drawings, in which

Fig. 1 is an elevation view of the indicator mechanism, and

Fig. 2 is a detail of the centrifugal brake mechanism employed by the indicating mechanism.

The mechanism comprises a degree counter **11**, and a separate independently driven minute counter **22** operatively associated therewith.

As shown in Fig. 1, a pair of synchronous receivers **3** and **4** control the motor **5** the output of which is placed in gear box **6**; the motor output is fed through the gear box **6** back to the receivers and on shaft **7** to a second gear box **8** which has a pair of output shafts **9** and **10**. The shaft **9** drives degree counter **11** through the Geneva gears **12** and **13**, low speed shaft **14**, bevel gears **15** and **16** and counter shaft **17**.

The high speed driving means for minute counter **22** includes the shaft **10**, gear box **18**, output shaft **19**, interruptable coupling **20**, high speed shaft **21**, bevel gears **23** and **24**, and counter shaft **25**.

The interruptable coupling **20** comprises a disk **26** which is secured to the upper end of the shaft **19**, and a heart shaped disk **28**, having a depression **40** in the periphery thereon, which is secured to the lower end of the shaft **21**. A lever **27** which is pivotally secured to the disk **26** is provided with a cam follower **41** which is normally yieldingly held in the depression **40** by a tension spring **30** having one end thereof secured to the disk **26** and the other end thereof secured to the lever **27**. During normal operation of the mechanism the shaft **21** will be driven in unison with the shaft **19** through the disk **26**, lever **27**, cam follower **41** and disk **28**, due to the engagement of the cam follower **41** with the disk **28** in the depression **40** thereof. But when the shaft **19** is rotated faster than a predetermined rate, due to fast slewing, the cam follower **41** will be thrown out of the depression **40** by centrifugal force thereby breaking the driving connection between the shaft **19** and the shaft **21** and stopping the rotation of the

shaft **21** which will then remain stationary until the cam follower **41** again engages the depression **40**. The speed of the shaft **19** at which the cam follower **41** is thrown out of the depression **40** is dependent upon the rigidity of the tension spring **30** which in turn is dependent upon the maximum allowable speed of the minute counter **22**. The interruptable coupling **20**, as described, therefore constitutes in effect a single position centrifugally actuated clutch. The counter **22** will always read the same upon re-engagement of the cam follower **41** with the depression **40** as it did at the time of disengagement, regardless of the number of rotations of the shaft **19** between disengagement and re-engagement.

The connection between the shaft **21** and the counter **22** is such that the counter **22** is advanced sixty minutes (60′) or one degree (1°) for each revolution of the shaft **21**. Therefore, since the shafts **9** and **19** are both rotating in their timed relation to each other during disengagement of the shafts **19** and **21**, the counter **22** will always be in synchronism with the counter **11** upon re-engagement of the shafts **19** and **21**. For example, let it be assumed that the shafts **19** and **21** were disengaged when the counter **22** read 36′ and the counter **11** read 104° and that the shaft **19** made ten revolutions between disengagement and re-engagement of the shafts **19** and **21**. During this time the counter **22** would not have been registering but the counter **11** would have been advanced ten degrees from 104° to 114°, so that upon re-engagement the counters **11** and **22** would read 114°36′, the correct reading. The same holds true for any number of revolutions of the shaft **19** during disengagement thereof with the shaft **21**.

Preferably the mechanism is provided with a centrifugal brake **31** shown in plan in Fig. 2. This brake comprises a drum plate having an internal drum face **33** lining a circular aperture in the plate. Centrally disposed within the aperture is a rotating member **34** mounted on the shaft **21**. Brake arms **35** and **36** are pivotally attached to the member **34** on each side of the shaft **21**, the arms being inwardly biased by springs **37** and **38** which connect the free end of each arm to the pivotal end of the opposing arm. The arms have foot members with curved outer surfaces adapted to bear on the drum face **33** when the arms are outwardly pivoted by the rotating speed of the driven member **34**. Accordingly, the brake provides additional protection for the minute counter against excessive speed in the event the interruptable coupling fails to disengage.

It is understood that modifications in the actual design of the indicating mechanism may be effected without departing from the scope of invention as defined in the appended claims.

What is claimed is:

1. An indicating mechanism for visually indicating changes in degrees and minutes of latitude or longitude having a degree counter which is operative to indicate changes in degrees of latitude and/or longitude, and a separate independent minute counter which is operative to indicate changes in minutes of latitude and/or longitude in conjunction with said degree counter, and means by which said degree counter and said minutes counter are adapted to be actuated in accordance with signals imparted to said mechanism, said mechanism comprising; a degree counter which is adapted to be constantly driven, a separate independently driven minutes counter which is adapted to be driven in timed relation to said degree counter when said degree counter is driven below a predetermined speed, and to be maintained stationary when said degree counter is driven above said predetermined speed, a power input shaft which is adapted to be constantly driven at varying speeds in accordance with signals imparted to said mechanism, a first output shaft which

is adapted to be constantly driven by said power shaft, a second output shaft which is adapted to be constantly driven by said power shaft independently of said first output shaft and at a substantially greater speed than said first output shaft and in a constant predetermined ratio with respect to said first output shaft, interconnecting means between said first output shaft and said degree counter through which said degree counter is adapted to be driven by said first output shaft, a high speed connecting shaft disposed in axial alignment with said second output shaft with the upper end thereof operatively connected to said minute counter, and a centrifugally actuated single position clutch means interposed between said high speed connecting shaft and said second output shaft through which said connecting shaft is adapted to be driven in unison with said second output shaft below a predetermined speed of said second output shaft and by which said connecting shaft is adapted to be automatically disconnected from said second output shaft when said second output shaft exceeds said predetermined speed.

2. An indicating mechanism as defined by claim 1 in which said clutch means comprises a first disk secured to the lower end of said high speed connecting shaft, a depression in the periphery of said first disk, a second disk secured to the upper end of said second output shaft in close proximity to said first disk, an arm pivotally secured to said second disk, a cam follower secured to the free end of said arm for engagement in the said depression in said first disk, a tension spring yieldingly biasing said cam follower into engagement with said depression, said cam follower being adapted to be thrown out of engagement with said depression when said second output shaft exceeds said predetermined speed.

3. An indicating mechanism as defined by claim 2 in which said high speed connecting shaft is provided with a centrifugally acting brake mechanism.

4. An indicating mechanism as defined by claim 3 in which said interconnecting means between said first output shaft and said degree counter includes means by which said degree counter is intermittently driven by said constantly driven first output shaft.

5. An indicating mechanism as defined by claim 4 in which said means by which degree counter is intermittently driven by said constantly rotating first output shaft comprises a low speed connecting shaft and a geneva drive through which said low speed connecting shaft is adapted to be driven by said first output shaft.

6. An indicating mechanism as defined by claim 1 in which said high speed connecting shaft is provided with a centrifugally acting brake mechanism.

7. An indicating mechanism as defined by claim 1 in which said interconnecting means between said first output shaft and said degree counter includes means by which said degree counter is intermittently driven by said constantly driven first output shaft.

8. An indicating mechanism as defined by claim 7 in which said means by which said degree counter is intermittently driven by said constantly rotating first output shaft comprises a low speed connecting shaft and a geneva drive through which said low speed connecting shaft is adapted to be driven by said first output shaft.

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