Aug. 13, 1946. A. L. DENNISTON ET AL 2,405,818

LOCK DISK FOR TIMING SYSTEMS

Original Filed Feb. 26, 1942 2 Sheets-Sheet 1

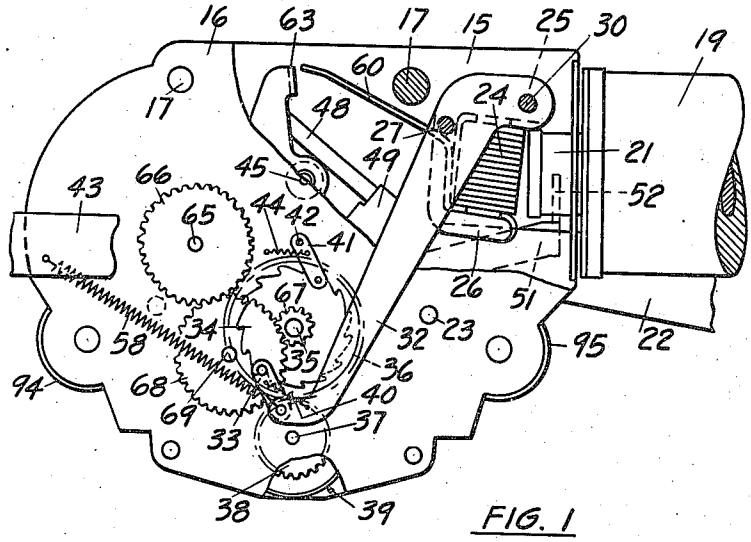


FIG. 1

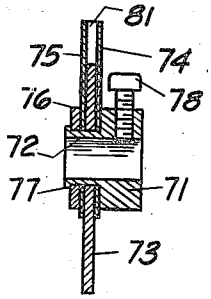


FIG. 8

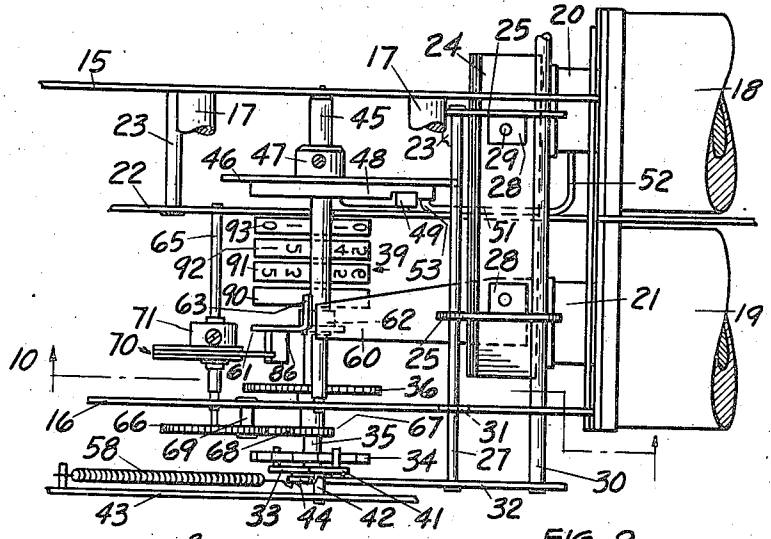


FIG. 2

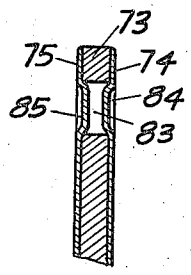


FIG. 9

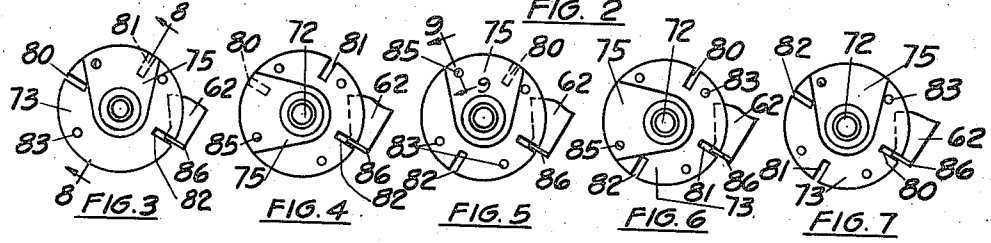


FIG. 3 FIG. 4 FIG. 5 FIG. 6 FIG. 7

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Original Filed Feb. 26, 1942 2 Sheets-Sheet 2

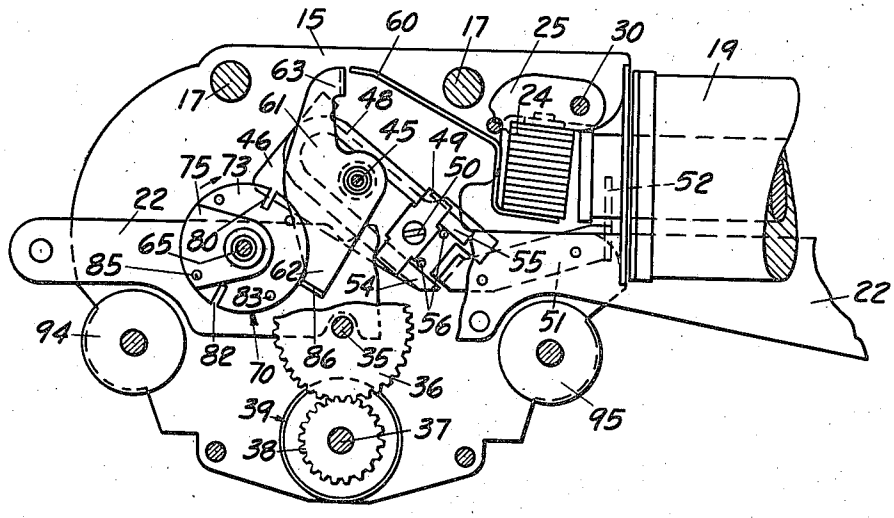


FIG. 10

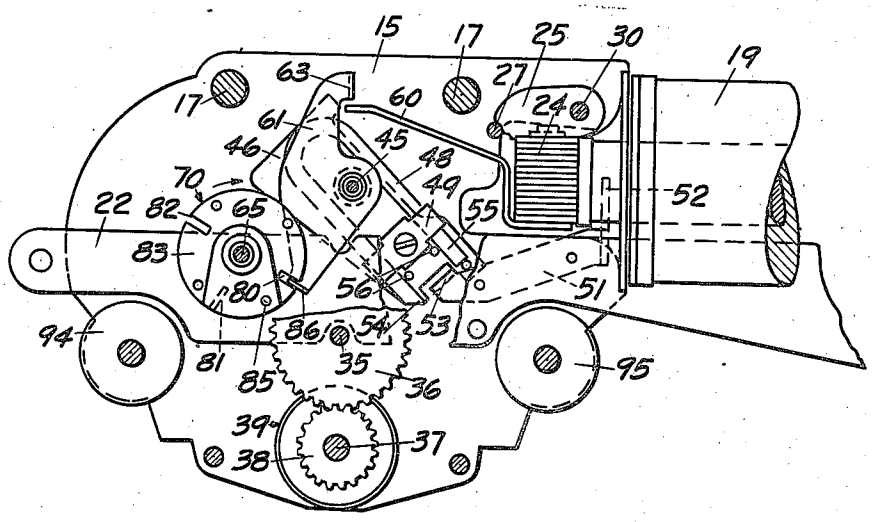


FIG. 11

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LOCK DISK FOR TIMING SYSTEMS

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Original application February 26, 1942, Serial No. 432,386. Divided and this application March 6, 1944, Serial No. 525,222

3 Claims. (Cl. 74—526)

1

This invention relates to improvements in secondary apparatus for time systems and particularly to an improved corrective mechanism for time recorders operated in circuit with a master clock.

This application is a division of our co-pending application, Serial No. 432,386, filed February 26, 1942, and is directed to the novel locking disk for the corrective secondary mechanism disclosed and claimed in said application.

With reference now to the drawings in which like numerals designate like parts—

Fig. 1 is an elevation of the secondary mechanism of a job time recorder which constitutes a preferred embodiment of this invention. Certain parts of the mechanism are broken away for the purposes of clarity;

Fig. 2 is a plan view of the mechanism shown in Fig. 1;

Fig. 3 is an elevation of the time disk, shown in Figs. 1 and 2, the time disk being adjusted for a half hour cut-out period;

Fig. 4 is an elevation of the time disk which has been adjusted for a forty-five minute cut-out period;

Fig. 5 is an elevation of the time disk as shown in Fig. 4, but in a changed position;

Fig. 6 is an elevation of the time disk which has been adjusted for two forty-five minute cut-out periods;

Fig. 7 is an elevation of the time disk as shown in Fig. 6 in changed position;

Fig. 8 is a sectional elevation of the time disk taken along line 8—8 of Fig. 3;

Fig. 9 is an enlarged sectional elevation taken along line 9—9 of Fig. 5;

Fig. 10 is a section taken along line 10—10 of Fig. 2; and

Fig. 11 is a section similar to that shown in Fig. 10 with the parts in changed position.

Referring now to Figs. 1 and 2, the reference numerals 15 and 16 designate two plates on which the secondary mechanism is mounted, these plates being held in spaced relationship to each other by means of spacers 17. Two coils, 18 and 19, which constitute an electromagnet, are suitably mounted with respect to the side plates 15 and 16, the coils being provided with pole pieces 20 and 21. An intermediate plate 22 is disposed between the side plates 15 and 16, and extends between the coils 18 and 19, this plate 22 being suitably mounted with respect to plate 15 by spacers 23 as shown in Fig. 2.

An armature 24 is provided for cooperation with the pole pieces 20 and 21, the armature

2

being made up of a plurality of laminations which are held together by means of the two yoke-shaped plates 25. The yoke-shaped plates 25 are provided with suitable lugs 28 which engage the top and bottom laminations, and rivets 29 serve to hold the assembly together. Rigidity is imparted to the assembly by means of the tie rod 27 which passes through and is secured to each of the plates 25. A shaft 30 is journalled in the side plates 15 and 16, and the yoke-shaped plates or armature holders 25 are secured to the shaft 30. Both the shaft 30 and the tie rod 27 are extended through plate 16, the plate being provided with a suitable slot 31 to permit rotation of the armature assembly.

Mounted on the shaft 30 and the tie rod 27 exteriorly of the plate 16 is an arm 32 which carries at one end a pawl 33. A ratchet wheel 34 is mounted on a shaft 35 which is journalled in the side plates 15 and 16, and ratchet wheel being disposed exteriorly of the plate 16 so that it may be engaged by the pawl 33. A gear 36 is secured to the shaft 35 which meshes with another gear 38 mounted on a shaft 37. The latter shaft is journalled in the side plates 15 and 16 and is disposed immediately beneath the shaft 35. A plurality of type wheels, which are generally designated by the reference numeral 39 are mounted on the shaft 37.

A spring 40 extends between the pawl 33 and the arm 32 and serves to urge the pawl into engagement with the ratchet wheel 34. A locking pawl 41 is also provided for cooperation with the ratchet wheel, the locking pawl being mounted on a pin 42 which extends inwardly from a plate 43. The plate 43, which is partially broken away in Fig. 1, may be suitably secured with respect to the plate 16 by spacer means not shown herein. One end of a spring 44 engages the locking pawl 41 and the other end is secured to the plate 43, so that the locking pawl will be urged against the ratchet wheel. An operating spring 58 is provided for the armature assembly, one end of the spring engaging the arm 32, and the other end being affixed to the plate 43.

In operation it will be seen that when the coils 18 and 19 are energized, that the armature assembly, comprising the armature 24, the yoke-shaped plates 25, and the arm 32, will be rocked in the counter-clockwise direction, as shown in Fig. 1, against the tension of the operating spring 58. This causes the pawl 33 to be drawn over one tooth of the fifteen tooth ratchet wheel 34. When the coils 18 and 19 are deenergized, the operating spring 58 causes rotation of the as-

sembly in a clockwise direction, thereby rotating the ratchet wheel for one-fifteenth of a revolution. The locking pawl 41 serves to prevent counter-clockwise rotation of the ratchet wheel 34 as the pawl 33 is retracted during energization of the electromagnet.

If the coils 18 and 19 are energized once every minute, it will be seen that the ratchet wheel 34 is driven thereby at a speed of four revolutions per hour. The gears 36 and 38 are so proportioned that the shaft 37 upon which the type wheels 39 are mounted, is caused to rotate at a speed of ten revolutions per hour.

A rock shaft 45 is suitably journalled in the side plates 15 and 16, and a plate 46 is suitably mounted on the rock shaft by means of a hub 47. A small permanent magnet 48, in the shape of a horseshoe, is secured to the plate 46 by means of a small overlying plate 49, and a screw 50 which takes into the plate 46. A plurality of pins 56 project from the surface of the plate 46 and engage the permanent magnet 48 to hold it in a predetermined position with respect to the plate 46.

A strip of magnetic material 51 is secured to the intermediate plate 22 as shown in Fig. 2, one end 52 of said strip embracing the pole piece 20, and the other end of said strip being bent over to form an auxiliary pole piece 53. This auxiliary pole piece extends between the north and south poles 54 and 55 respectively, of the permanent magnet 48.

The coils 18 and 19 are so wound that when energized by a current of normal polarity the pole piece 20 is the south pole, and the pole piece 21 is the north pole. Thus, the permanent magnet is normally in the position as shown in Fig. 10 wherein the north pole 54 of the permanent magnet 48 is attracted by the pole piece 53. However, when the coils 18 and 19 are energized by a current of reversed polarity, it will be seen that the pole piece 20 and the auxiliary pole piece 53 are both north poles, and the rock shaft 45 is caused to rotate in the clockwise direction due to the attraction of the south pole 55 by the pole piece 53 which is of the opposite polarity.

An arm 60 is secured at one end to the armature 24 and its opposite end terminates at a point above the rock shaft 45. A rock plate 61 is secured to the rock shaft 45 by means of a hub 62, and is provided with a bent-over lug 63 which is adapted to engage the arm 60. When the coils 18 and 19 are energized by a current of normal polarity, the lug 63 will be clear of the arm 60, thereby permitting operation of the armature 24. But when the coils 18 and 19 are energized by a current of reversed polarity, the rock plate 61 is caused to rotate from the position shown in Fig. 10 to the position shown in Fig. 11 so that the lug 63 engages the arm 60 and the armature assembly is locked in its attracted position. Subsequent impulses of reversed polarity will therefore have no effect upon the armature, and the ratchet wheel 34 will not be advanced by said impulses.

Journalled in plates 16 and 22 is a shaft 65 which carries a gear 66 exteriorly of the plate 16. A pinion 67 is mounted on the shaft 35, and meshes with an idler gear 68 which in turn is mounted on a stub shaft 69 secured to the plate 16. The gear 66 meshes with the idler gear 68 so that the shaft 65 is driven from the shaft 35, the gears being so proportioned that the shaft 65 normally rotates at a speed of one revolution per hour.

The operation of the armature locking means is additionally controlled by a time disk, indicated generally by reference numeral 70, which is mounted on the shaft 65. The time disk, as shown in Fig. 8, comprises a hub 71 which is provided with an extension in the form of a sleeve 72. A disk 73 is secured to the sleeve 72. Plates 74 and 75, each in the form of a sector, are rotatably mounted on the sleeve 72 at either side of the disk 73. A washer 76 is positioned on the sleeve 72 exteriorly of the plate 75, and the sleeve is upset as indicated at 77, to hold the assembly together. The hub 71 is provided with a set-screw 78 extending therethrough so that the position of the disk 73 may be fixed with respect to the shaft 65. The disk may be keyed to the sleeve 72, or otherwise associated therewith in non-rotatable relationship. The disk is provided with three slots 80, 81 and 82, which are disposed at 90° from each other. The disk is also provided with a series of apertures 83, which cooperate with stamped depressions 84 and 85 formed in the plates 74 and 75. It will be seen from an inspection of Figs. 3 through 7 that the position of the plates 74 and 75 may be shifted so as to block-out one or more of the slots 80, 81 and 82. The depressions 84 and 85 cooperate with one or the other of the apertures 83 so that the plates will be maintained securely in their adjusted positions.

The plate 61 is provided with a bent-over lug 86, which lug is adapted to drop into one of the slots 80, 81 or 82 as the time disk is rotated, providing that the coils 18 and 19 are actuated by an impulse of reversed polarity. The purpose of the time disk is to prevent the operation of the armature locking mechanism which comprises the rock plate 61 and the permanent magnet 48, except during certain positions of the time disk. These positions, of course, are determined by the times during which one of the slots 80, 81 or 82 are opposite the lug 86.

The secondary mechanism herein described is adapted to be connected into the corrective circuit of a time system such as that disclosed in Patent No. 2,332,828 issued October 26, 1943, to Lorenz et al. In that particular system a master clock transmits an impulse every minute to the secondaries which are connected in circuit therewith. At certain predetermined intervals, such as at every hour, a series of rapid impulses is also transmitted to the secondary. The rapid impulses and several of the minute impulses immediately preceding them are of reversed polarity, and may be termed locking impulses, inasmuch as they cause operation of the locking mechanism to lock the armature of a secondary in operative position. The remaining minute impulses are of normal polarity, and may be termed non-locking impulses. The pawl and ratchet mechanism, 33 and 34, cause the mechanism to be advanced step by step by each minute impulse through a cycle of operation which corresponds to the cycle of operation of the master clock. During each cycle, the secondary mechanism moves through a locking position, that is a position in which one of the slots 80, 81 or 82 is opposite the lug 86. As pointed out above, the secondary will be locked in this position if a locking impulse is received at this time, and it will remain locked in this position and will not be advanced until a non-locking impulse or an impulse of normal polarity is received by it.

When the secondary is on time, that is, when it is in phase-synchronism with the master clock,

the secondary will be locked only during the transmission of the rapid impulses, this is during the 59th minute in the system above referred to.

If the secondary is slow, it will not be locked until it has been advanced by the rapid locking impulses to the 59th position, and then it will be locked in that position until the 60th impulse unlocks the armature. If the secondary is fast, it will be locked in the 59th position by one of the locking impulses which precedes the rapid impulses. In the system above referred to, the 52nd through the 59th impulses are locking impulses, so the secondary will be corrected if it is not more than seven minutes fast.

The slots 80, 81 and 82 are so arranged that the cycle of operation of the secondary may be shifted with respect to the cycle of operation of the master clock. If the plates 74 and 75 are adjusted to cover the slot 81, and if the secondary is disconnected from the corrective circuit for half an hour, it will be seen that when the secondary is again connected into circuit it will be one-half hour slow. This one-half hour represents the non-productive period, or as it might be termed, the disconnected interval, the recording of which is not desired.

Before the disconnected interval, correction is effected during the 59th minute of each hour by the dropping of the lug 86 into the slot 80 as shown in Fig. 11. After the disconnected interval, the slot 82 will be opposite the lug 86 during the 59th minute of each hour, if the secondary is on time, and the secondary will be locked in the desired position (half an hour slow) during the transmission of the rapid impulses. Similarly, if the secondary is a few minutes fast or slow, correction will be effected with respect to the slot 82, as shown in Fig. 3.

But if the slot 82 were covered so that correction could be effected only with respect to the slot 80, the armature 24 would not be locked during the 59th minute, and the secondary would be advanced by the rapid impulses, and the disconnected half hour would be picked up and recorded by the type wheels. This is the reason why secondaries with only one corrective position, or only one slot or notch, must be connected into a non-corrective circuit after the disconnected interval.

The type wheels 39 comprise a blank wheel 90, a tenths of an hour wheel 91, an hour wheel 92, and a ten hour wheel 93, this arrangement being adapted to operate for 20 hours out of each 24. Of course, if it is desired to connect the recorder to the time system for 8, 16 or 22 hours or any different period of time, the proper sized wheel may be substituted for wheels 92 and 93. The blank wheel 90 is secured to the shaft 37 and rotates with the gear 38 at the rate of ten revolutions per hour. The tenth of an hour wheel 91 is advanced one step by each revolution of the wheel 90 by the usual carry-over mechanism not shown herein, and the wheels 92 and 93 are advanced by their preceding wheels in a like manner. The blank wheel 90 is provided so that the printing position of the first printing wheel 91 of the series will not be affected by any variation in the relative position of the ratchet 34 and the pawl 33 during consecutive operations, nor by any tendency of the ratchet to creep when the armature 24 is in its attracted position.

In operation, the secondary mechanism, including the ratchet wheel 34 and its associated parts, are normally advanced step by step by the impulses transmitted by the master clock over the corrective circuit, the armature being free to operate as shown in Fig. 10. The type wheels 39 will be advanced every sixth minute to record the time elapsed since the beginning of the work day.

If, however, an uncovered slot in the time disk 70 is opposite the lug 86 during the transmission of a locking impulse, the armature will be locked in its operated position as shown in Fig. 11. This position of the secondary mechanism as a whole may be termed the chronologically synchronized position inasmuch as at the end of the 59th minute, the position of the secondary is synchronized with that of the master clock, irrespective of the relationship of their positions when the armature 24 is first locked, provided that this relationship does not exceed the maximum fast or slow correction of the system and of the particular secondary. The armature is unlocked by the 60th impulse, which may be termed the synchronizing impulse, and the operating spring 58 causes the mechanism to be advanced one step.

As pointed out above, when the plates 74 and 75 of the time disk 70 are adjusted to cover slot 81, the secondary is caused to shift its chronologically synchronized position after a disconnected interval of half an hour from that shown in Fig. 11 to that shown in Fig. 3.

If a disconnected period of forty-five minutes is desired, the plates may be adjusted to cover slot 80, as shown in Figs. 4 and 5. For instance, the chronologically synchronized position of the secondary at some time in the morning, say at 11:59, is shown in Fig. 4, and if the recorder is disconnected during a lunch period from 12:00 to 12:45, by 12:59 the time disk will have advanced only 90°. This position is a chronologically synchronized position because, as shown in Fig. 5, the slot 81 is 90° behind slot 82.

If the plates 74 and 75 have been adjusted so that no slot is covered, the chronologically synchronized position of the time disk at 12:59 P. M. and at 7:59 P. M., as shown in Fig. 6, is the same as that shown in Fig. 5, except for the changed position of the plates. The position of the plates as shown in Figs. 6 and 7 permits a second disconnected period of forty-five minutes, say a supper period for the second shift between 8:00 P. M. and 8:45 P. M. The chronologically synchronized position of the time disc after this second disconnected interval, say at 8:59 P. M., is shown in Fig. 7.

Obviously these disconnected intervals may bear any relation to the chronologically synchronized positions; that is they need not immediately follow them as above described.

At the end of the work day, the secondary should again be disconnected from the corrective system for a period of one-half hour or fifteen minutes, as the case may be, in order to shift the chronologically synchronized position back again to the slot 80 so that the secondary will again be in the correct position to start out a new day. As the time wheels accumulate only up to twenty hours, as herein disclosed, this disconnected interval should be lengthened sufficiently so that the type wheels will be in their "0" position at the beginning of the next day.

It is obvious that disconnected intervals, other than the thirty minute or forty-five minute intervals above mentioned, may be provided by forming the slots in different positions. For instance, disconnected intervals of twenty minutes or forty minutes can be provided by forming the slots 80, 81 and 82 at 120° from each other. Similarly, intervals of thirty-five or fifty minutes may

be provided, it not being essential that the interval be a fraction of one hour. It may also be desired to have two or more slots in a group, spaced from each other by a distance representing five or ten minute intervals. In this event one plate may cover the whole group, and the plate may be shifted to selectively expose one or the other slots of the group. In the alternative, of course, a slot could be provided in one of the plates which would overlap a much wider slot in the disk 13 in order to permit adjustment of five or ten minutes one way or the other.

If desired, one wall of the slot may be disposed at an angle to the other to permit a camming-out action of the lug 86 when the armature is manually operated, as described in the above mentioned patent.

Although only a preferred embodiment of this invention has been described herein, it is obvious that numerous modifications and changes in the size, shape and proportion of the parts may be made without departing from the spirit of this invention. The above description is illustrative only, and this invention is defined only by the appended claims.

We claim:

1. A time disk for controlling the operation of a job time recorder comprising a hub member, a disk secured thereto, plates rotatably mounted on said hub on either side of said disk and held against the side surfaces of said disk, the periphery of said disk being cut-away at a plurality of points and said plates being a width sufficient to cover one of said cut-away portions and having an outer edge matching the periphery of said disk whereby said plates may be rotated with respect to said disk to selectively cover one or the other of said cut-away portions.

2. A time disk for controlling the operation of a job time recorder comprising a hub member, a disk secured thereto, plates rotatably mounted on said hub on either side of said disk and held against the side surfaces of said disk, the periphery of said disk being cut-away at a plurality of points and said plates being adapted to cover one of said cut-away portions to form a continuous peripheral edge whereby said plates may be adjusted with respect to said disk to selectively cover one or the other of said cut-away portions, and means to maintain said plates in adjusted position.

3. A time disk for controlling the operation of a job time recorder comprising a hub member, a disk secured thereto, plates rotatably mounted on said hub on either side of said disk and held against the side surfaces of said disk, the periphery of said disk being cut away at a plurality of points and each of said plates being a width sufficient to cover one of said cut-away portions and having an outer edge matching the periphery of said disk whereby said plates may be rotated with respect to said disk to selectively cover one or more of said cut-away portions, said disk being provided with a plurality of apertures and said plates being provided with depressed portions adapted to fit into said apertures whereby said plates may be held in place overlying one or more of said cut-away portions.

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