Nov. 5, 1968 LA V. H. WILLIAMS 3,409,903

ELAPSED TIME RECORDER WITH PRINTING DISK AND CONCENTRICALLY MOUNTED STRIKERS

Filed Feb. 28, 1967 5 Sheets-Sheet 1

Fig. 1.

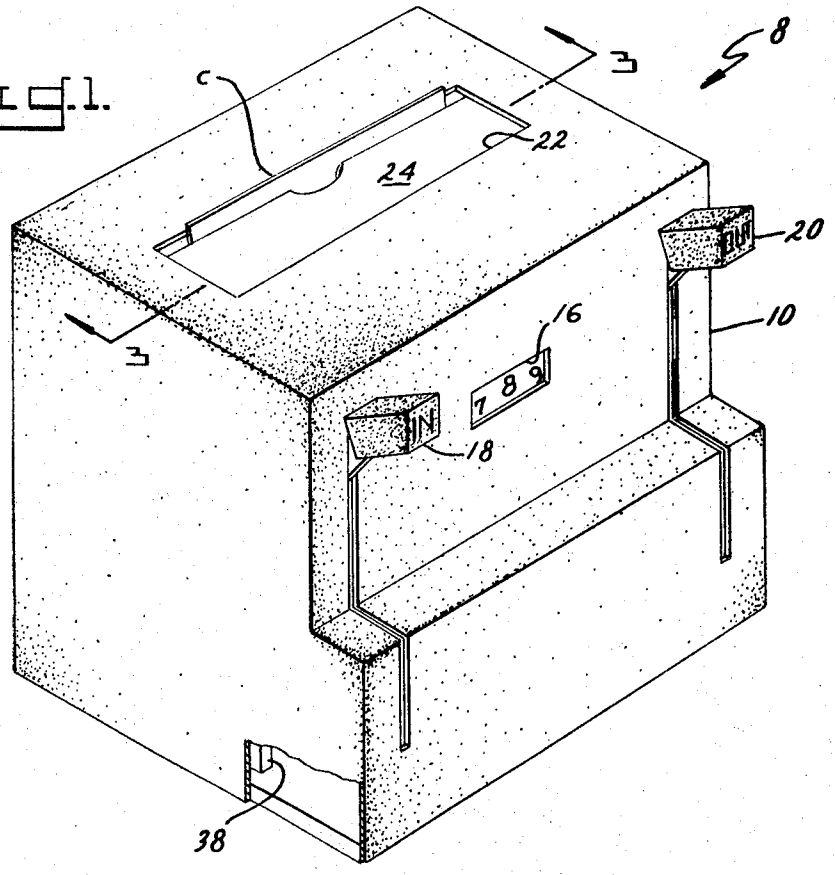


Fig. 2.

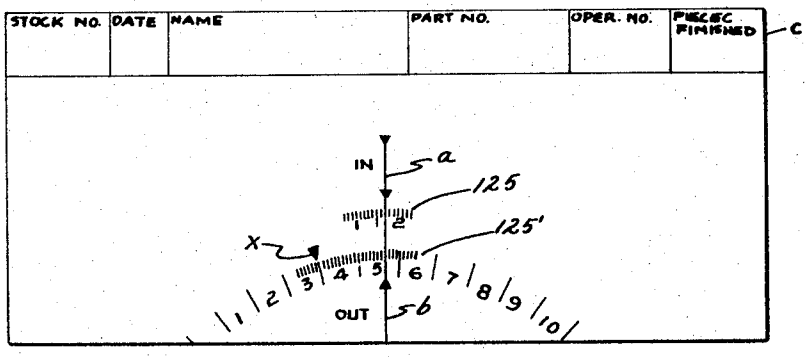


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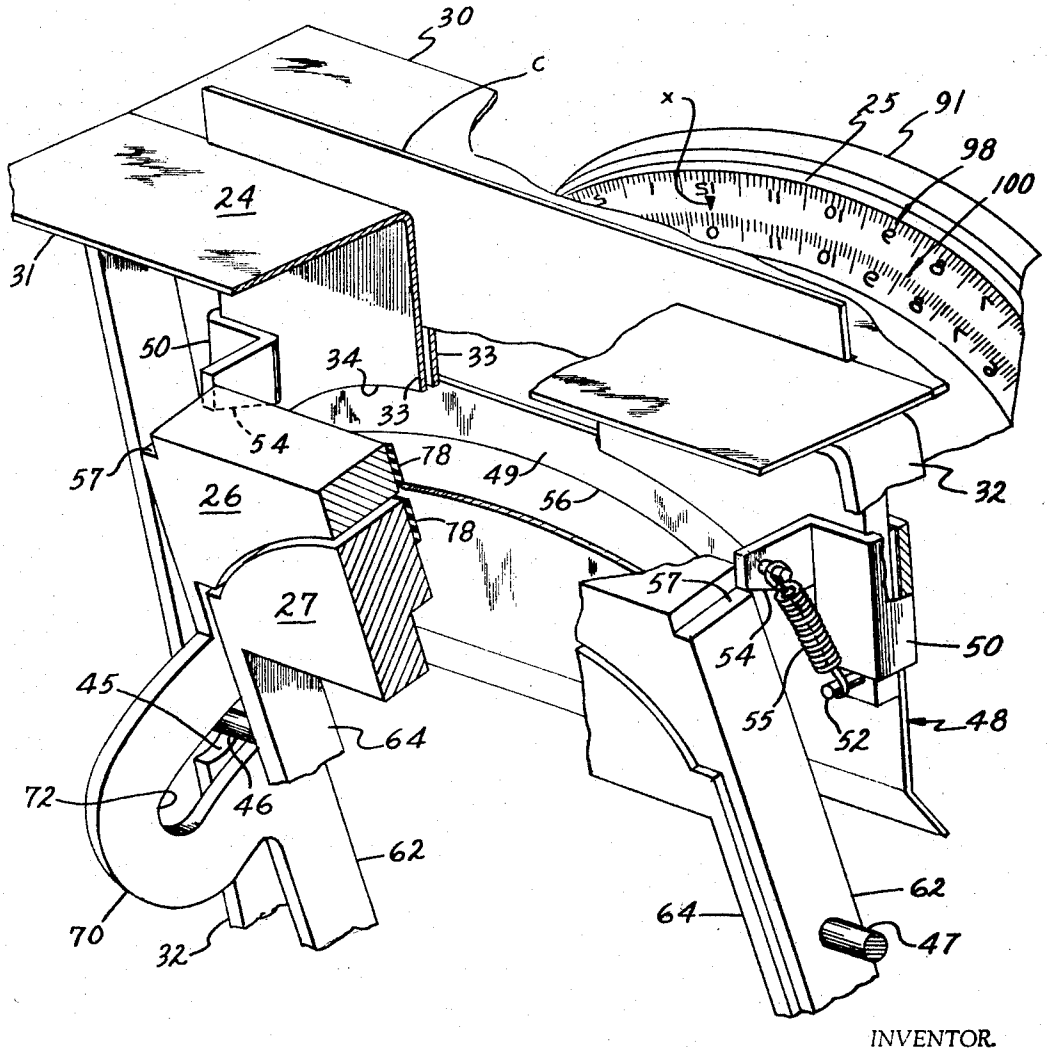
Fig. 2.

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ELAPSED TIME RECORDER WITH PRINTING DISK AND CONCENTRICALLY MOUNTED STRIKERS

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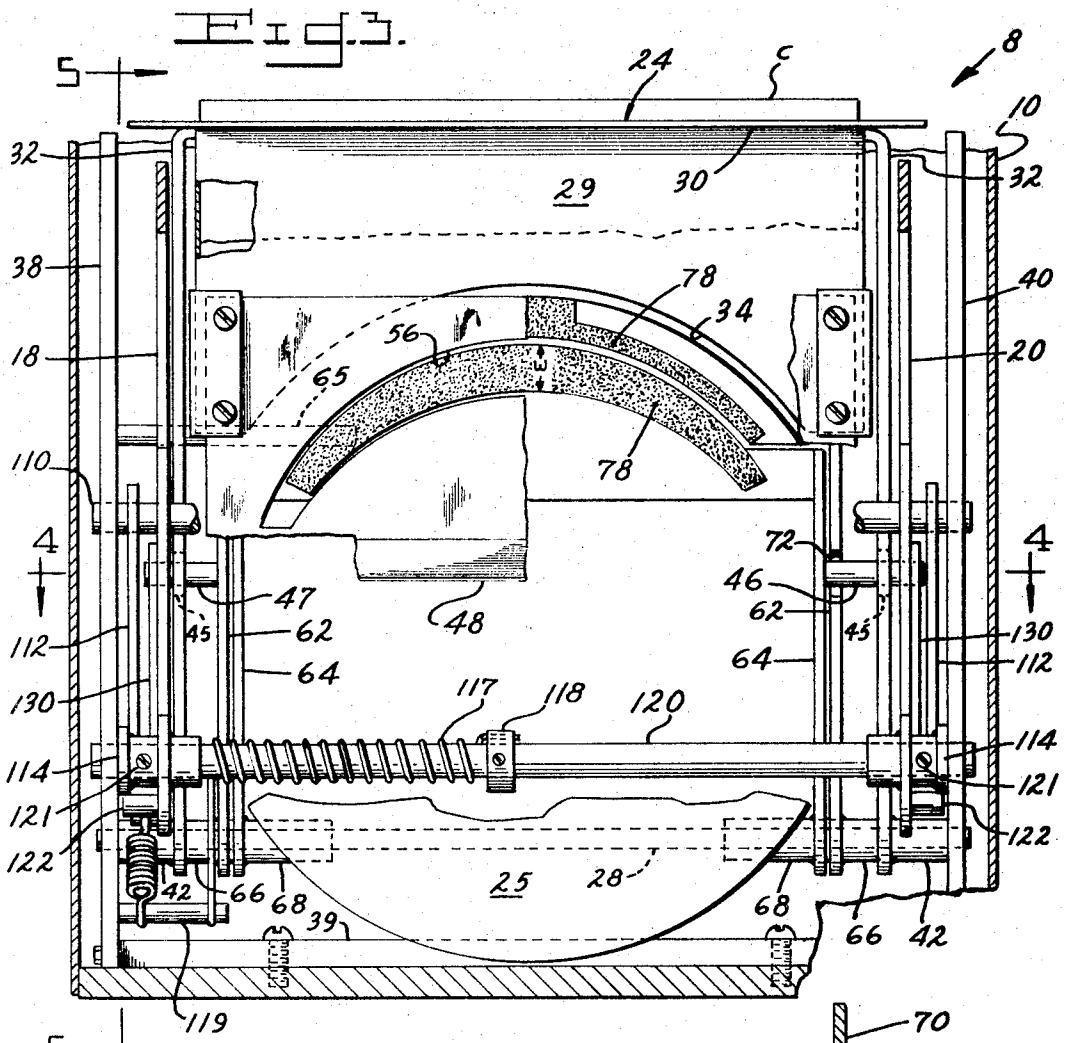
Fig. 3.



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ELAPSED TIME RECORDER WITH PRINTING DISK AND CONCENTRICALLY MOUNTED STRIKERS

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Fig. 5.

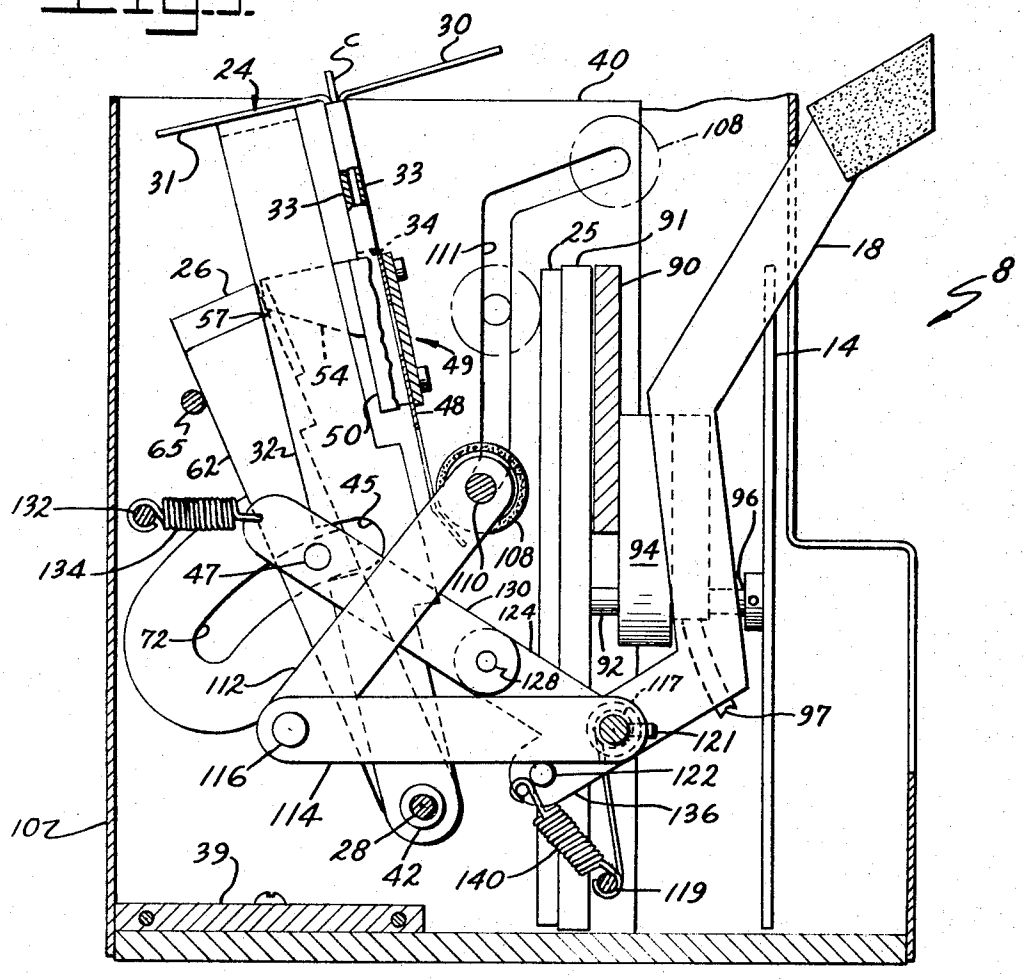


Fig. 7.

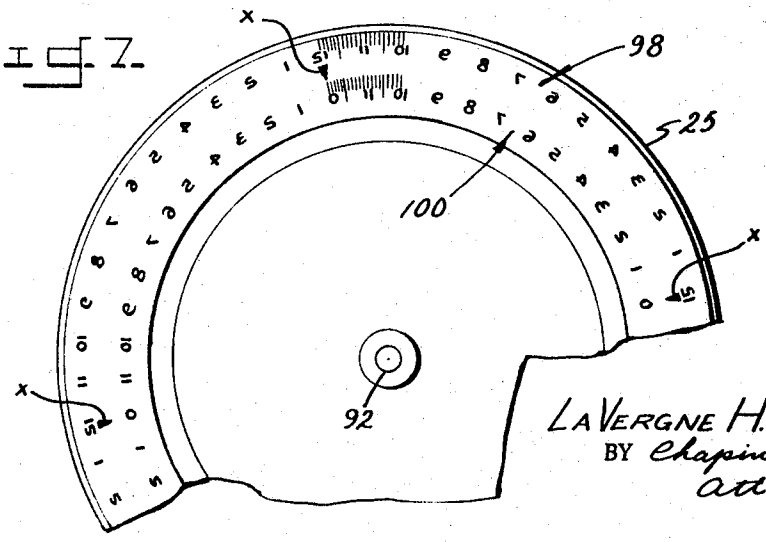


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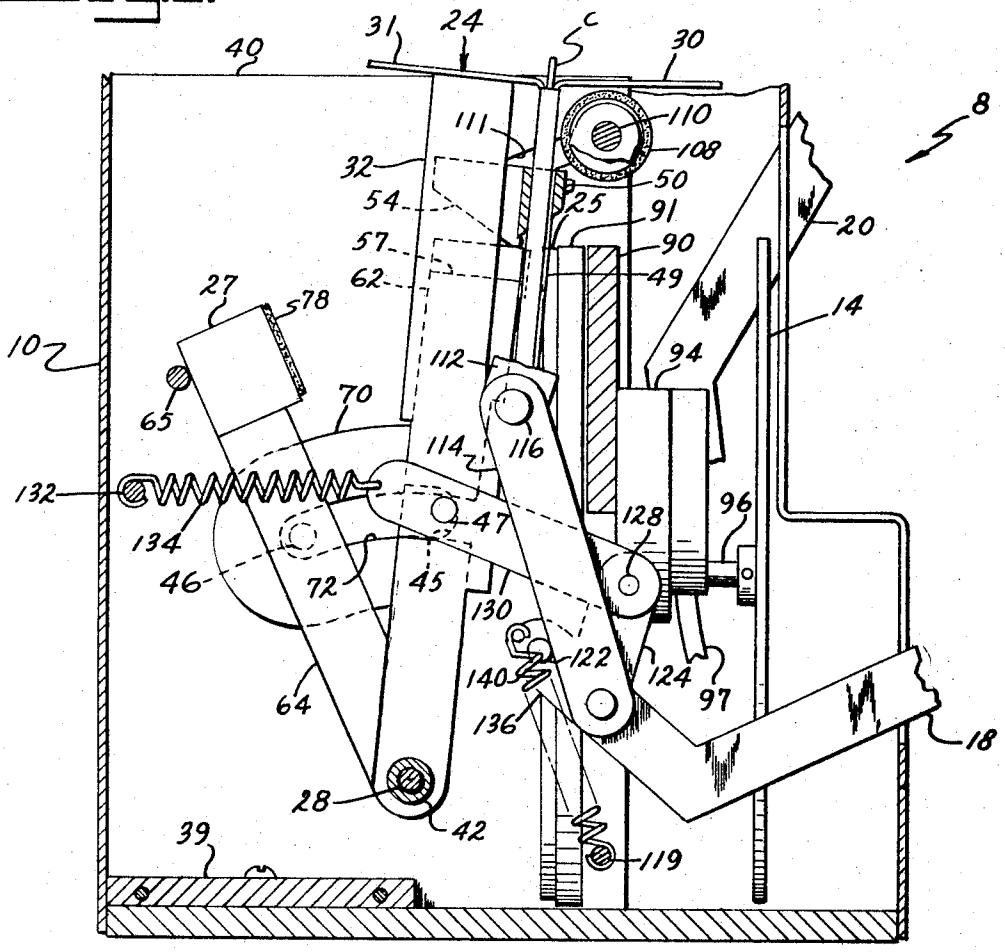
Fig. 6.



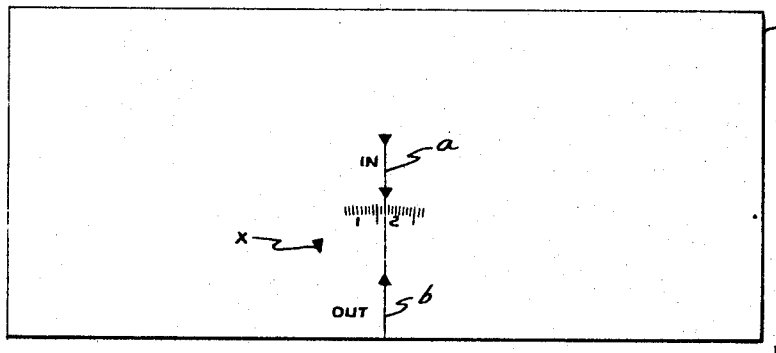




Fig. 8.

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United States Patent Office 3,409,903 Patented Nov. 5, 1968



3,409,903

# ELAPSED TIME RECORDER WITH PRINTING DISK AND CONCENTRICALLY MOUNTED STRIKERS

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Filed Feb. 28, 1967, Ser. No. 619,345
7 Claims. (Cl. 346—82)

## ABSTRACT OF THE DISCLOSURE

An elapsed-time time clock having a clock mechanism rotating a printing member on which are carried two concentric rings of time indicia, a pair of printing hammers each pivotably disposed to engage respectively one of the concentric rings of indicia, and a card carrier disposed between the printing member and the printing hammers. Means is provided for bringing either of the hammers and the card carrier into printing contact with the printing member whereby sequential operation of said hammers with a time card carried by the card carrier will cause the card to be imprinted with the time of the first hammer operation, the time of the second hammer operation, and the time elapsed between the two operations.

*Background*

Down through the years, a great variety of time clocks have been marketed for a variety of uses. One of the most popular time clock was the so-called elapsed-time time clock. This type of clock not only provides an indication of arrival and departure time, but also automatically indicates the time that passed between the arrival and departure and are widely used for a variety of purposes such as job shop clocks, parking lot timers and factory "In" and "Out" clocks.

The advantages of such a clock are obvious, but heretofore the elapsed-time time clocks available were quite complex and expensive to produce.

It is an object of this invention to provide a mechanically and operationally simple elapsed-time time clock which is extremely accurate and reliable while being relatively inexpensive and easy to manufacture.

FIG. 1 is a perspective view of a time clock embodying the present invention;

FIG. 2 is a partial perspective view of the card marking mechanism of the time clock;

FIG. 3 is a section view taken generally along line 3—3 of FIG. 1;

FIG. 4 is a section view taken generally along line 4—4 of FIG. 3;

FIG. 5 is a section view taken generally along the line 5—5 of FIG. 3;

FIG. 6 is a view similar to FIG. 5 with the mechanism shown in different operative relationship;

FIG. 7 is a partial view of the printing disk used in the present invention;

FIG. 8 is a view of a time card used with the present invention showing "In" time indicia thereon; and

FIG. 9 is a view of a time card used with the present invention showing "In" and "Out" time indicia thereon as well as elapsed time.

Referring to FIG. 1 for an overall description of the present invention, it will be seen that a time clock **8** comprises outer casing or housing **10**. The front wall of the housing **10** is provided with an opening **16** through which a time indicating dial may be viewed. A lever **18** which as shown may be marked "In" and another lever **20** designated "Out" are disposed on opposite sides of



an indicating dial **14**. The top wall of the housing is slotted at **22** to provide access to a card receiver or carrier **24**, opening upwardly to receive time cards C, also shown in FIG. 9. The slot **22** is of sufficient size to accommodate movement of the carrier as will hereinafter be described.

As shown, the time clock embodying this invention comprises a rotatable printing disk **25** driven by a timer, a card carrier **24** and a pair of concentrically arranged strikers or hammers **26** and **27** pivotable together with the card carrier **24** about a shaft **28** (FIG. 5). As will be hereinafter described, selective downward movement of the "In" and "Out" levers **18** and **20** causes pivotable movement of either the outer or the inner striker or hammer **26** and **27**, respectively, toward the printing disk **25**, the face of which is provided with two concentric bands or rings of printing indicia, FIG. 7. The card carrier is also pivotable in response to movement of either lever **18** or **20** to bring one of the hammers, depending upon the lever selected, and the card into contact with a peripheral portion of one of the bands of indicia carried by the printing disk. When the "In" lever is actuated a first time is recorded on the card in FIG. 8, and when the "Out" hammer is subsequently actuated, a second time is recorded on the card concentrically within the first time imprinted on the card. As will be later described, the card will also automatically show the elapsed time between the actuation of the "In" and "Out" hammers.

As shown in FIGS. 2–4, the card carrier **24** comprises a card receiver portion **29** in the shape of an upwardly opening U-shaped chamber which communicates with the slot **22** provided in the upper wall of the casing **10**, FIG. 1. The card receiver may be formed of any suitable material, such as metal or plastic, and as shown includes oppositely extending flanges **30** and **31**. A receiver slot is provided between spaced opposed plates **33** which extend downwardly from the adjacent inner edge of the flanges **30** and **31**. The lower edges of the plates **33** are of semi-circular configuration forming an arcuate recess or opening **34** for the lower portion of a card C fitted into the receiver. This opening provides access for contact with the card on one side by the printing disk and on the other by the strikers. Shoulders, not shown, are provided within the outer edges of the receiver to support the card in proper printing position. The receiver is supported by a pair of downwardly extending support members or arms **32** which, as shown in FIG. 2, are secured at their upper ends to the flange **30**. At their lower ends the arms **32** are pivotally mounted on the shaft **28** which is supported at its outer ends by side plates **38** and **40**.

The side plates are secured to outer edges of a base plate **39** which is in turn anchored to the bottom of the casing or housing **10**. As further shown in the drawings, the card carrier **24** is held in fixed axial position on the shaft **28** by hubs **42** which extend in fixed relation from the arms **32** and abut the side plates **38** and **40**. Each of the carrier arms **32** is provided with a notch **45** positioned to receive a pin **46** and **47** which extends outwardly from one of the striker arms **64** and **62**, respectively, when the hammers are moved in response to actuation of the "In" and "Out" levers **18** and **20**. In this way pivotable movement of either of the hammers toward the printing disk **25** is transmitted to the card carrier **24**.

A vertically slidable printing shield **48** is carried by the card carrier **24**. As best seen in FIGS. 2, 3 and 6, the shield comprises a face plate portion **49**, channel shaped end portions or brackets **50** fitted around the end walls of the card receiver **29** (FIG. 2). The slide shield is supported by a rod or pin **52** which extends rearwardly from the card carrier **24** adjacent the opposite ends thereof.

Camming members **54** (FIG. 2) extend outwardly at each end of the shield, generally perpendicular to the plane of movement of the slide. Coil springs **55** extend from each of the camming members **54** to the pins **52** and urge the shield to its lowermost position as shown in FIG. 2. The camming members are actuated by the forward movement of the striker **26** provided with cam engaging shoulders **57** which serve to engage the inclined lower edge of the camming members **54** to raise the shield **48** as the striker **26** is swung toward the printing disk **25**. The face plate **49** of the shield is provided with a semi-circular slot or cutout **56** disposed to cover, at least in part, the semi-circular recess **34** of the card carrier when the slide is in its lowermost position. In this position the slot **56** registers with the "Out" striker **27** and when raised, as will be hereinafter described, the slot is dimensioned to register with the recess **34** of the card carrier to permit the "In" striker **26** to operate through the registered cutout **56** and recess **34** to press a card C carried by the card carrier against the face of the printing disk **25**. The shield with slot **56** thus operates like a shutter to expose to the printing disk only that portion of the card on which indicia will be printed. This insures clean sharp printing only at the desired locations; there is no incidental marking on the card, such as by the "Out" indicia when the "In" lever is operated.

The striker mechanism of the clock includes the previously mentioned strikers or hammer elements **26** and **27**, FIGS. 2 and 6, each of which is pivotably supported by means of a pair of arms **62** and **64**, respectively. The arms **62** and **64** are pivotable about their lower ends on the same shaft **28** as the carrier arms **32** of the card carrier. Stop pin **65** extends from side wall **38** of the casing and engages the legs **62** and **64** of the two strikers. Hubs **66** extend from the striker arms **62** to hold the "In" hammer in fixed axial position on shaft **28** and to provide bearing surfaces to stabilize the swinging movement of the hammer. Hubs **68** similarly hold the "Out" hammer in fixed axial position on shaft **28**.

The strikers **26** and **27** are selectively pivotable about shaft **28** in response to movement of the "In" and "Out" levers and may be designated as the "In" hammer **26**, shown as the outer hammer in FIG. 2. The "Out" hammer **27** is disposed radially inward of the hammer **26**. One of the legs **62** of the "In" hammer has an arcuate extension **70** with a forwardly opening slot **72** of sufficient circumferential length to permit full striking movement of the "In" hammer independently of the "Out" hammer. As shown in FIG. 2, the pin **46**, extending from one leg **64** of the striker **27** fits through the slot **72** at its open end. The path of movement of the outer end of the pin **46** intersects the notch **45** in the card support arm **32**. Thus when the arms **62** are swung forward carrying the striker **26**, the pin **46** does not interfere with this movement. The "Out" printing hammer **27** is also pivotally mounted on shaft **28** by "Out" hammer legs **64** and is disposed within the "In" hammer **26**. Movement of hammer **27** is transmitted to the card carrier by the pin **46** being received in notch **45** of one of the arms **32**, and movement of striker **26** is transmitted to the card carrier by pin **47** being received in the notch **45** in the other carrier arm **32**.

Each of the hammer elements is surfaced with a suitably resilient material, such as shown at **78** (FIG. 3) to cushion the printing stroke and insure a clear imprint on the card. The width *w* of the printing face is approximately equal in dimension to one-half the width of the printing face **25** and approximately to the width of slot **56** in the shield **48**. In this way, when the "Out" hammer strikes a card against the printing face only the inner printing indicia will be reproduced on the card. The printing face of the "In" hammer **26**, on the other hand has a radially stepped configuration with the wider portion near its center and reduced width at the outer ends thereof. The function of this particular arrangement will be explained below.



The printing head is supported by a mounting bracket **90** which is secured to the side walls **38** and **40**, and comprises a backing plate **91** rotated by a shaft **92** which is rotated by a clock mechanism **94**. The clock mechanism **94**, which may be an electrical clockmotor, also rotates a shaft **96** upon which is mounted the time indicating dial **14** which shows through the slot **16** on the front of the housing **10**. An electrical lead **97** is provided for connection to a source of electricity to the clockmotor **94**.

Carried on the side of the backing plate adjacent the carrier is the printing disk or plate **25** having two bands of printing indicia **98** and **100**, concentrically disposed about the periphery of the disk **25**. The printing indicia comprises four, twelve hour quadrants, and the clock drive mechanism is correspondingly forty-eight hours per revolution. The strikers are of selected length measured from the shaft **28** so that the "In" hammer **26** will contact the outer band **98** of numbers, and the "Out" hammer **27** will contact the inner band **100** of numerals when each is swung forward by the corresponding lever. A forty-eight hour disk was selected because of its low rate of rotation. It was found that contact of the striker does not affect its accuracy while the accuracy of a mechanism of higher rotational speed is actually effective by the stopping action of the striker pressing the card against the surface of the printing disk.

A reservoir type inking roll **108** is provided so that for each operation of either lever arm ink is applied to that portion of the printing head which at the time is the upper fractional portion of the printing face.

The inking roll is rotatably carried in a shaft **110** which has its outer end portions extending into a guide channel **111** provided in each of the side plates **38** and **40**.

The ink roll shaft is caused to move across the upper portion of the printing head in response to actuation of both the "In" and "Out" levers. Roll activating means comprises a pair of links **112** through which the ink roll shaft extends. The links are disposed adjacent the outer ends of the shaft and inwardly of the side walls **38** and **40**. The other end of each of the links **112** is pivotably connected to a link **114** by means of pivot pins **116**. The opposite end of each of the links **114** is fixedly connected by set screw **121** to shaft **120** (FIG. 3) which extends between the side walls **38** and **40**. A pin **122** extends from each of the "In" and "Out" levers and causes the ink roll control linkage to move the ink roll from its lowermost position, FIG. 5, to its uppermost position, FIG. 6. The ink roll follows the path of the guide channel **111**. Movement of one of the links **114** is transmitted to the shaft **120**, since it is fixedly connected thereto. As a result, the other link **114** connected to the opposite end of the shaft **120** is also operated. Thus operation of either lever **18** or **20** operates both links **114** and both links **112** to carry the ends of the roll shaft **110** upwardly in the channel **111** whereby inking of the printing face is accomplished by movement of either the "In" or "Out" levers. A torsion spring **117** is fitted around the shaft **120**. The inner end of the spring is secured to a collar **118** affixed to the shaft. The outer end of the spring is secured to a pin **119** which extends from the housing. The spring **117** urges the shaft to the angular position corresponding to the lower position of the ink roll **108**. Thus when the ink roll is raised and the lever **18** or **20** released, the spring **117** will return the shaft to its initial angular position and return the roll **108** to its lowermost position.

Means for operating the "In" and "Out" hammers and for advancing the card carrier **24** to the printing position shown in FIG. 6, comprises the "In" lever **18** and the "Out" lever **20** connected to mechanical operating linkages to swing the hammers and cards about their common shaft **28**. The levers **18** and **20** are mounted adjacent opposite ends of the shaft **120** which is supported at its outer ends by the side plates **38** and **40**. Referring to FIGS 5 and 6, it will be seen that both levers **18** and **20** have forked or bifurcated lower end portions, thus making four

portions. The upper leg **124** of the forked end of each of the levers **18** and **20** is pivotably attached by a pin **128** to one end of a link **130**. The other end of the link **130** is pivotably attached to the hammer arm **62** by the pin **47** which, as previously mentioned, lies behind the carrier leg **32** in the slot **45**. A coil spring **134** is attached at the outer edge of each link **130** and each is secured by a pin **132** to the adjacent side plate of the clock housing. The spring **134** releasably retains the levers in their uppermost position as in FIG. 6, and returns the levers and associated linkages to this position, as shown in FIG. 6.

The lower leg **136** of the forked portion of the levers **18** and **20**, each include a pin **122** which extends outwardly from the lever to a position underlying each link **114**. Pins **122** serve to transmit the motion of the levers **18** and **20** to each pair of coupled links **114** and **112**, the latter being pivotably connected to opposite ends of the ink roll shaft **110**. A coil spring **140** is attached to the lower end of each of the levers **18** and **20** and to a pin **119** secured to the adjacent side walls of the housing, so as to releasably urge the levers into their upward position, whereby they are automatically returned by these springs to their FIG. 6 position when they are released.

The hammers or strikers **26** and **27** and card carrier **24** are also moved by the levers **18** and **20** whose pivotable motion is transmitted by links **130** to the pins **47** and **46**. These pins carry the "In" and "Out" strikers respectively toward the printing disk **25**. As previously mentioned, the pins **46** and **47** will pick up the adjacent carrier leg **32** and carry it into contact with the printing disk **25**. Substantially simultaneously the ink roll is moved by the pairs of linkages **114** and **112** to apply ink to the upper portion of the printing disk.

*Operation*

The operation of the time clock of the present invention will be best understood by first referring to FIGS. 8 and 9. In particular, FIGS. 8 and 9 show one type of time card *c* which may be used with the present invention. The card *c* may be pre-printed with the name of the employer-company, with positions available for the name of the employee, the name of the particular job, the date, and any other desired information. As shown, the card *c* has imprinted thereon "In" and "Out" arrows *a* and *b* respectively disposed at the approximate center of the card.

Referring to FIG. 7 and as mentioned earlier, the printink disk **25** has two concentric bands of time indicia thereon; the "In" time indicia **98** and the "Out" time indicia **100**. As shown, each set of time indices is divided into a quadrant of equally spaced graduations. Reading clockwise, it can be seen that the "In" set counts down from 12 to 12, while the "Out" set counts down from 0 to 0. As designed, each quadrant represents a 12 hour period. As is further shown under numeral 12 of the "In" set, there is a pointer arrow *x*. This pointer comes into play in indicating elapsed time, as well be explained.

Due to the quadrant design of the printing disk **25** and the semi-circular design of the "In" and "Out" printing faces, each printing of the "In" printing face and the "In" set of indices on the time card *c* will result in a small segment of the "In" time indices **98** being printed on the card *c* and a pointer *x* as shown in FIG. 8, while each printing of the "Out" indicia results in a full quadrant of printing on the time card *c* as shown in FIG. 9, with the completed card being as shown in FIG. 9.

In the actual operation of the time clock, a blank time card *c* is placed in the card slot of card carrier **24** so that the lower end of card *c* extends across the semi-circular recess **34** of the carrier.

At this point the relative position of the elements of the time clock are as depicted in FIGS. 2 and 6. The "In" lever **18** is then pressed downward which results in the following sequence of events. First, pin **122** carried by lever **18** contacts the lower edge of link **114** which is fixedly mounted to the shaft **120**. The shaft is thus rotated to move link **114** on the opposite end thereof. This in turn causes both links **112** to move upwardly carrying the inking roll **108** thereon upwardly in guide channels or camming slots **111** to ink the face of the printing disk.

Substantially simultaneously with the commencement of movement of the inking roll, the leg **124** of lever **18** starts to pull link **130** forwardly. This action causes the "In" printing hammer **26** to pivot forward due to the connection of pin **47** between link **130** and "In" hammer leg **62**. The slot **72** permits movement of hammer leg **62** by the pin **46** which is at this time stationary.

As the "In" hammer **26** approaches the U-shaped card carrier **24** with the card *c* therein, the printing shield **48** is cammed upwardly by the action of the hammer **26** against camming members **54**. When the shield **48** has been cammed to its highest point, the cutout section **56** in the plate **49** is registered with the printing face **78** of the "In" hammer **26**. At the same time the shield **48** is being cammed, the pin **47** fits into notch **45** on carrier arm **32** and advances the carrier with the striker **26**.

Referring again to the inking roll **108**, as it is forced upwardly in the camming slots **111**, it comes in inking contact with about one quadrant of each set of indicia **98** and **100** on the printing disk. This action prepares the printing disk for printing on the card *c*.

With a further downward movement of the "In" lever **18**, the inking roll is led out of the way by camming slots **111**, while the printing face **78** of hammer **26** comes into contact with the back of card *c*, thereby pressing the card against the "In" indicia **98** of the printing disk through the cutout **56** of the shield plate **49**.

Once the "In" lever **18** is released, biasing means such as springs **117**, **134** and **140** return the various levers and linkages to their original positions. Spring **55** returns the shield **48** to its original position. At this point, the time card *c* (as shown in FIG. 8) is removed from the time clock and retained until a job is completed, or work is finished, etc.

After a job is done, a day's work completed, or any period of time has elapsed, the card *c* is replaced in the card carrier **24** as before. At this point the "Out" lever **20** is pressed downward. Like the action of the "In" lever **18** described above, two things happen substantially simultaneously. First, the pin **122** carried by lever **20** bears against link **114**, causing it to exert a force on link **112** to move the inking roll **108**, as previously described. Secondly, upper leg **124**, by its clockwise rotation about shaft **120**, causes link **130** to which it is attached, to pivot the "Out" hammer **27** by connection of link **130** to hammer leg **64** by pin **46**. During this movement, the pin **46** enters notch **45** in carrier leg **32**, whereby it also pivots the card carrier **24**.

With the printing face **78** of the "Out" hammer pressed up against the back of card *c*, the "Out" hammer **27**, card carrier **24**, and card *c* are pressed against the "Out" printing indicia **100** on printing disk **25** through the cutout section **56** of shield **48**. The resulting imprint on card *c* is as shown in FIG. 9, while the completed card is as shown in FIG. 10.

Finally, when the "Out" lever **20** is released, the various biasing means, previously discussed, return the parts to their original positions and the card *c* may be removed.

Referring to FIG. 9, it will be seen, for example, that the "In" row of indicia **125** indicates it was punched "in" at approximately 1:42 hours, while the "Out" indicia **125'** indicates it was punched "out" at approximately 5:12 hours. The pointer arrow indicates that elapsed time between "in" and "out" was 3½ hours.

It will readily be appreciated by those skilled in the art that the printing indicia on the printing disk need not be limited to time indicia, as shown in the illustrative embodiment. For example, any time related value, such as money, may be substituted for the time indicia shown.

In this way, a direct money reading may be obtained in proportion to a predetermined elapsed time.

Having thus described this invention, what is claimed is:

1. Elapsed time device comprising a rotatable printing disk having bands of indicia concentrically disposed about the face of the disk, one of said bands including a reference mark, means for rotating the disk in accordance with the passage of time, concentrically disposed strikers each separately mounted for pivotal movement into contact with a portion of one of said bands, a first and a second actuator, the first actuator being connected to pivot the first of said strikers, and the second actuator being connected to pivot the second of said strikers, a card receiver disposed between said printing disk and said strikers for holding a time card in position to be selectively imprinted by portions of said indicia, said reference mark on said printing disk being radially positioned to print on said card when said first striker is actuated whereby a subsequent operation of said second striker will result in elapsed time being indicated by the sequential operation of said strikers.

2. Elapsed time device as set forth in claim 1 in which said indicia are bands of numerals which are arranged in four quadrants with a reference indicator in each quadrant of one of said bands designated "In" band, the other band being designated the "Out" band, said card receiver being disposed between said strikers and said disk and pivotably mounted to be moved toward and away from the disk in response to operation of both the first and second actuators, said first striker being disposed to swing into contact at least a quadrant of said "In" band to imprint on a card numerals in said band, and at least one indicator in said quadrant, said second striker being disposed to contact at least a quadrant of said "Out" band whereby a card sequentially imprinted registers the elapsed time between the sequential imprintations.

3. Elapsed time device as set forth in claim 2 in which the card used in said device bears a reference mark disposed to designate the time of each of said sequential imprintations.

4. Elapsed time indicator comprising a printing disk having at least two concentric bands of time indicia disposed about the face of the disk, a timer for rotating said disk, a striker mechanism pivotably disposed for movement into and out of contact with the indicia of said disk, a card carrier pivotably disposed between the disk and striker mechanism and swingable to carry a card into juxtaposition with the indicia on said disk, a shield disposed between said disk and striker for selectvely exposing the inner and outer bands of indicia for imprinting one or the other on the card, and means for actuating said striker mechanism and carrier to swing the same into contact with said printing disk, said shield being radially movable in relation to the printing disk and in response to said actuating means to selectively expose one and the other of said bands for printing on a card disposed in said card carrier.



5. In an elapsed time indicator a time disk having two concentric bands of time printing numerals disposed about the face of said disk thereof, a pair of concentric hammers each separately pivotable into contact with each of said two time bands, a time card carrier pivotably disposed between the disk and said hammers, a first and second lever each connected to actuate only one of said hammers to pivot the same toward the printing disk, and means coupling the movement of each of said hammers to said carrier to move the carrier with a card therein into printing contact with the printing disk.

6. In an elapsed time indicator as set forth in claim 5 an index mark provided in each quadrant of one of said bands, said first lever and one of said hammers being disposed to imprint on a time card at least one of said index marks, the second lever and other hammer being connected to imprint subsequently on the same card a portion of the other band of numerals whereby the index mark indicates elapsed time between operation of the first and second levers.

7. In an elapsed time device a rotatable printing disk having two concentric bands disposed about the face of said disk, one of said bands including time related printing indicia and at least one elapsed time indicator mark, the other of said bands including time related printing indicia, and means for sequentially imprinting on a time card at least a portion of the first band containing said elapsed time indicator mark, and thereafter for imprinting on the card the time indicia from the second band, said means including a shield radially movable relative to said printing disk for selectively masking one and the other of said bands of printing indicia, whereby said mark indicates the time which has elapsed between the sequential imprintations.

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