United States Patent [19]

Uthenwoldt

[11] **3,869,885**

[45] **Mar. 11, 1975**

[54] **LOCKING SYSTEM**

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[73] Assignee: **Pitney-Bowes, Inc.,** Stamford, Conn.

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[52] **U.S. Cl.** ..... **70/315,** 70/333 R

[51] **Int. Cl.** **E05b 37/16,** G05g 5/00

[58] **Field of Search** 70/286, 287, 288, 292, 70/293, 304, 312, 315

[56] **References Cited**

UNITED STATES PATENTS

3,664,231 5/1972 Hanson 70/292

Primary Examiner—Albert G. Craig, Jr.

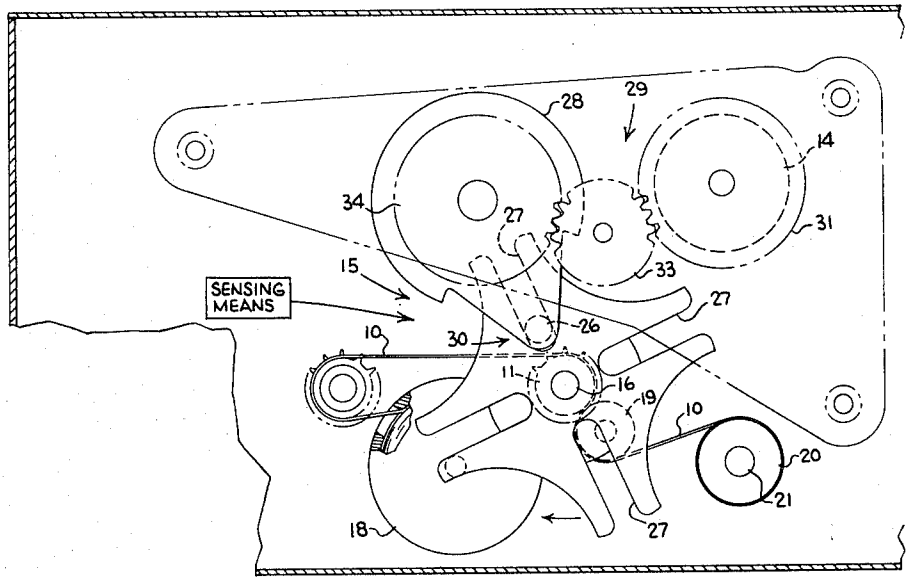
Attorney, Agent, or Firm—William D. Soltow, Jr.; Albert W. Scribner; Robert S. Salzman

[57] **ABSTRACT**

An improvement in a locking system of the type having a series of reference combinations arranged serially upon a tape. A combination entered into said system is compared with the reference combination, and if both combinations are complementary, a lock in the system is released.

The improvement comprises a positive intermittent drive mechanism for advancing the tape to a new reference combination position.

4 Claims, 4 Drawing Figures



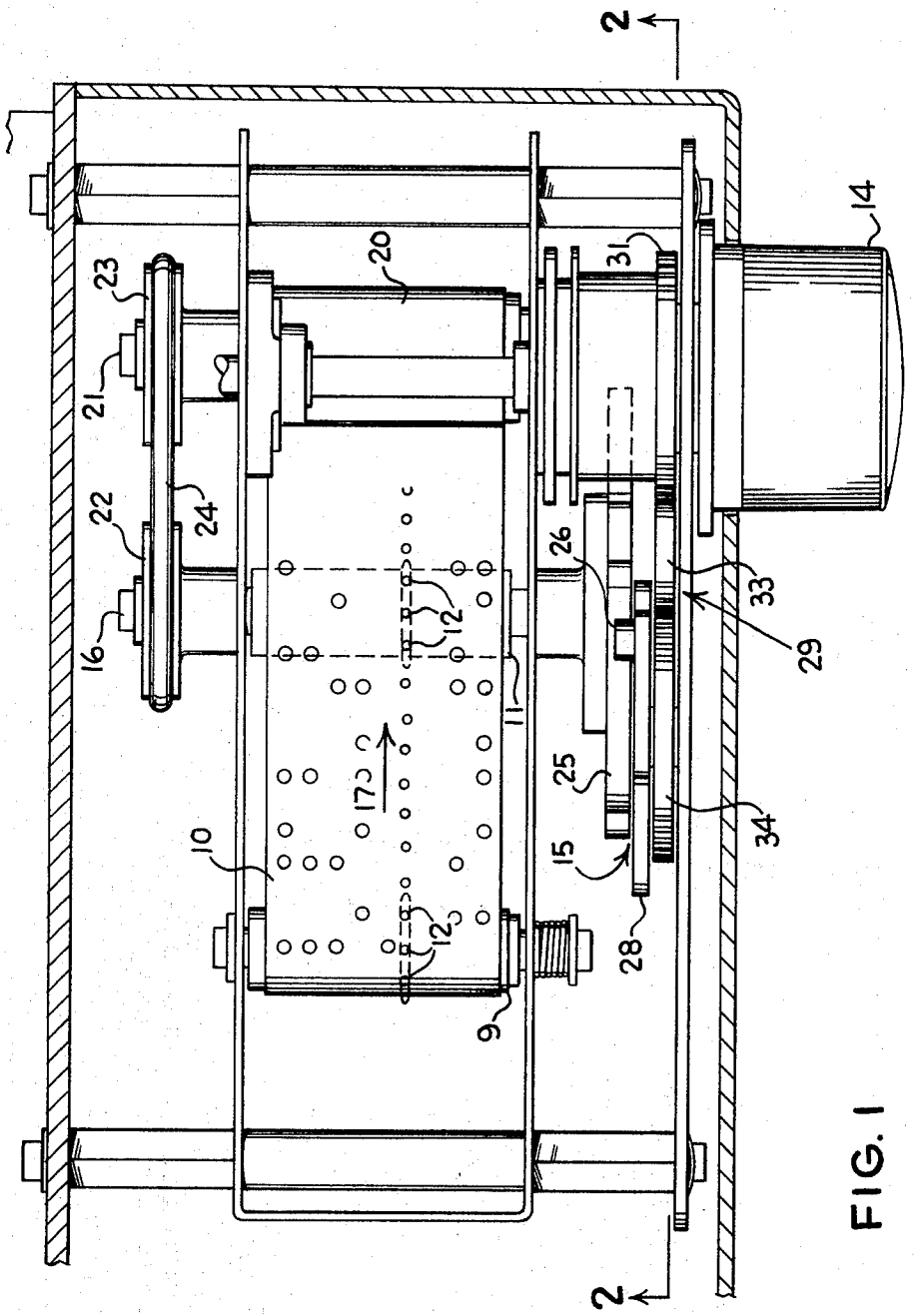


FIG. 1

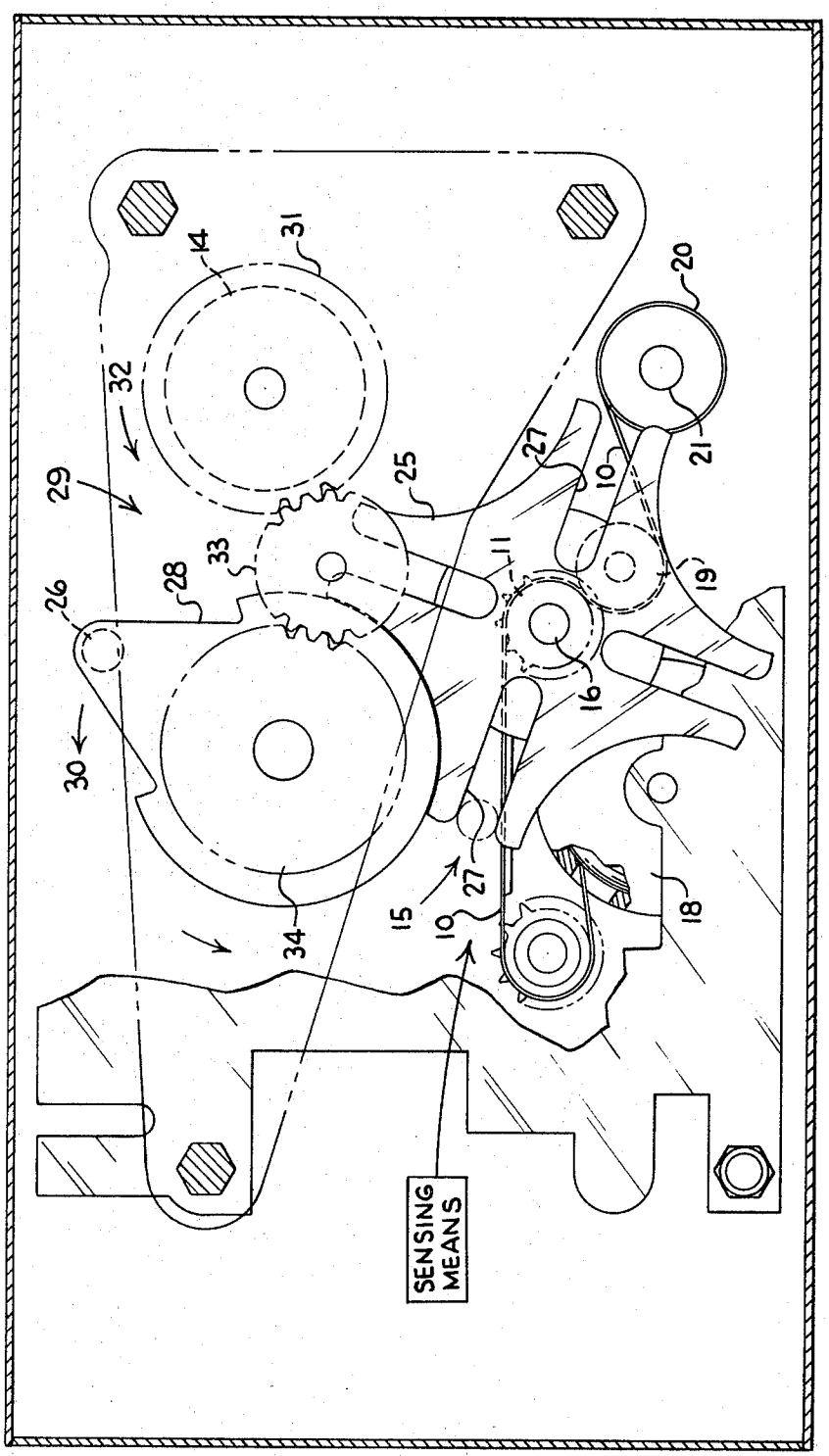

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SENSING MEANS

FIG. 2

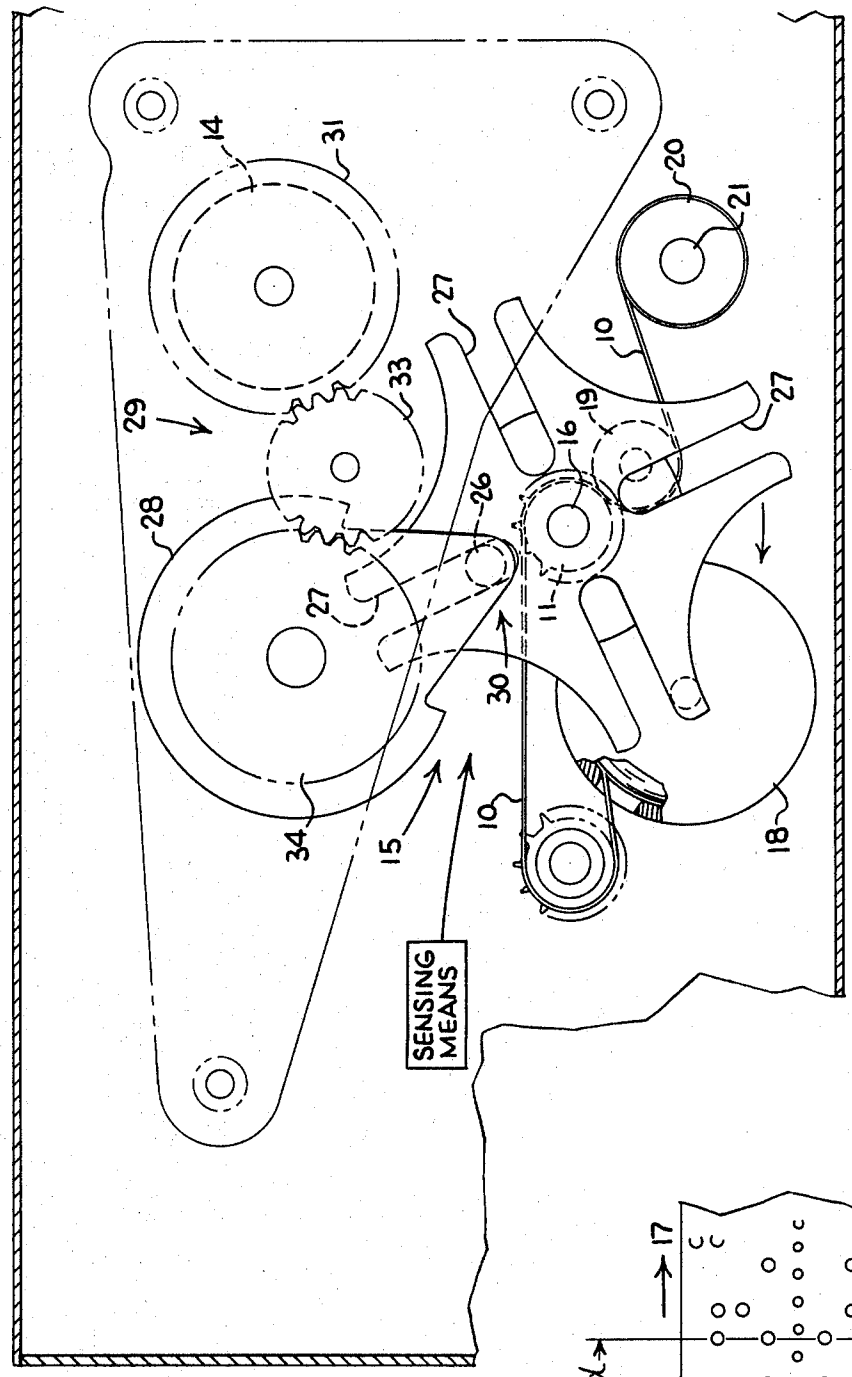

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SENSING MEANS

FIG. 3

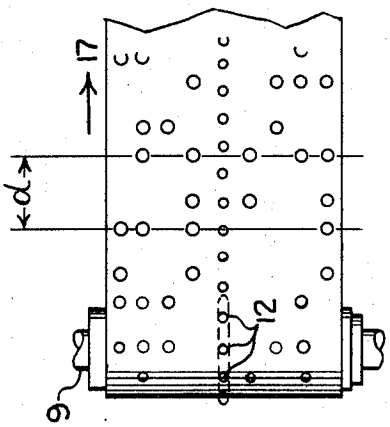

17
d
12
9

FIG. 4

LOCKING SYSTEM

This invention is for an improvement in a locking system, and more particularly for a positive intermittent drive mechanism for a locking system of the type having a series of reference combinations arranged serially upon a tape; a lock of the system being releasable when an entered combination complements a reference combination.

BACKGROUND OF THE INVENTION

The present invention is an improvement to the Locking Device shown in U.S. Pat. No. 3,664,231, issued to Walter J. Hanson on May 23, 1972.

In the above locking system, no means are provided to prevent theft which may result from a severing of the combination tape, and the repeated feeding of the same combination into the locking device for the purpose of unlocking the lock.

In the prior unimproved device, a severing of the tape would prevent the advancement of the tape to a new combination position. While the lock was so disabled, it was nonetheless possible to turn the input knob provided the last positioned tape combination was again entered on the input keyboard. The locking system could thus continuously be compromised, by repeatedly entering the tape combination which lastly appeared at the sensing fingers and turning the input knob every time the system locked-out.

In order to overcome the above-mentioned drawback, the prior system has been modified with a positive drive mechanism for the tape. Now if the tape should sever, or be caused to be severed, the tape will irrespectively advance to a new reference combination position. This will prevent the repeated use of an old combination.

SUMMARY OF THE INVENTION

The positive drive mechanism of this invention comprises a Geneva stop mechanism operatively connected between a tape advancing sprocket wheel and the input knob. When the input knob is turned, the Geneva stop mechanism incrementally turns, thus causing a tape advancing sprocket wheel to turn. The sprocket wheel will advance the tape to a new reference combination position irregardless of whether the tape is severed. This is so, because the tape advancing sprocket wheel is now positively driven, whereas before it was tension threaded through the mechanism, which tension threading would prevent tape advancement when there was a severing of the tape.

It is an object of the present invention to provide an improved locking system of the type having a series of reference combinations serially disposed upon a tape, and which requires an entered combination to complement the reference combination then appearing on the tape in order to unlock a lock of the system;

It is another object of this invention to provide a more secure locking system;

It is yet another object of the invention to provide a positive tape advancing drive mechanism for a locking system having a series of reference combinations disposed upon a tape.

These and other objects of this invention will be better understood and will become more readily apparent with reference to the following detailed description taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a top view of the reference combination tape and the positive drive mechanism improvement of this invention;

FIG. 2 is a sectional view of the inventive system taken along line 2—2 in FIG. 1, with the Geneva Stop Mechanism in an initial pre-operative drive position;

FIG. 3 is a sectional view shown in FIG. 2 with the Geneva Stop Mechanism part way through its incrementing advancement; and

FIG. 4 is a top view of the reference combination tape of FIG. 1 depicting a typical incremental advance *d* between successive combinations.

Generally speaking, the present invention is for a combination locking system of the type having a tape containing a plurality of predetermined reference combinations serially disposed thereon. The tape of the locking system is advanced to a new reference combination position for each unlocking operation performed upon the system. A new combination which is entered into the system during the unlocking operation, is required to complement the newly advanced reference, combination in order to unlock a lock of the locking system.

The locking system comprises a sensing means for sensing the reference combination appearing upon the tape for comparison with the entered combination. A tape driving means is provided for positively advancing the tape adjacent the sensing means, and a positioning means is operatively connected to the driving means for incrementally positioning a new reference combination adjacent the sensing means with each actuation of the positioning means, and means to actuate the positioning means.

As is otherwise specified herein, all parts, operations, and functions of the prior locking device shown in U.S. Pat. No. 3,664,231, are the same for the present inventive locking system.

Referring to FIG. **1**, a reference combination tape **10** is shown. The tape is depicted as lying between two sprocket wheels **9** and **11**. Teeth **12** of the respective spocket wheels **9** and **11** are made to engage with the combination tape **10**. Sprocket wheel **11** is positively driven by the Geneva Stop Mechanism shown generally by arrow **15**, which is actuated by turning input knob **14**.

The star wheel **25** of the Geneva Stop Mechanism is keyed to shaft **16** to which the sprocket wheel **11** is also keyed, such that the incremental rotation of the Geneva Mechanism will be inputed to the sprocket wheel **11**.

One full rotation of the input wheel **14** will cause a quarter rotation (90° of the Geneva Stop Mechanism and the sprocket wheel **11**, such that the tape **10** is advanced an incremental distance *d* to a new combination as shown in FIG. **4**. The tape is advanced in the direction shown by arrow **17**.

The tape **10** is fed from a feed roller **18**, (FIGS. **2** and **3**) to sprocket wheel **9**. The tape is then fed to sprocket wheel **11**, and then between and around tensioning roller **19** to the take-up roll **20**.

The shafts **16** and **21**, respectively, of the sprocket wheel **11** and take-up roll **20** support two pulleys **22** and **23**, respectively, as illustrated in FIG. **1**. Pulleys **22** and **23** are joined by a coil spring **24**, that provides synchronism between the sprocket wheel **11** and the take-up roll **20**.

The driving of the sprocket wheel **11**, and hence, the advancing of the combination reference tape **10**, will now be explained in more detail with reference to FIGS. **2** and **3**.

As aforementioned, the sprocket wheel **11** is made to turn and advance the tape **10** an incremental distance *d* (FIG. **4**) when the Geneva Stop Mechanism generally shown by arrow **15** is actuated.

The Geneva Stop Mechanism of this invention is designed to turn sprocket wheel **11** one-quarter of a revolution for every full turn of the actuating knob **14** (FIGS. **1** and **2**). The star wheel **25** of the Geneva Mechanism is engaged in one of its slots **27** by pin **26** of the driver wheel **28**. Driver wheel **28** is made to turn in the direction shown by arrow **30** by means of the gear-train generally depicted by arrow **29**. Gear **31** of the gear-train **29** is connected to knob **14** as shown in FIGS. **1** through **3**. Gear **31** is made to turn in direction **32** as shown by the arrow in FIG. **2**. when gear **31** rotates, it causes idler gear **33** to turn, which in kind causes gear **34** to rotate. Since the driver wheel **28** of the Geneva Mechanism is keyed to gear **34**, it will likewise be made to turn when gear **34** rotates.

FIG. **2** illustrates the driver wheel **28** at the initial stage of its travel before engaging with the star wheel **25**.

FIG. **3** depicts the driver wheel **28** in a latter stage of its travel with the pin **26** having entered slot **27** of the star wheel **25**. As can be seen from viewing the sequence of movement of the driver wheel **28** and the star wheel **25**, the star wheel **25** is caused to make a quarter of one revolution, for every full revolution of the driver wheel **28**. The star wheel is keyed to shaft **16**, as is sprocket wheel **11**, so that the sprocket wheel **11** will be caused to rotate a quarter turn with every full turn of knob **14**, as previously mentioned.

The sensing means, (sensing fingers) that read the combination from tape **10** are only shown in FIGS. **2** and **3** in schematic, since they are the same means shown in U.S. Pat. No. 3,664,231, and are not needed here to gain a full understanding of this invention.

It will be obvious to those skilled in this art that other incremental devices, other than the Geneva Mechanism shown in the drawings may be used to accomplish the purposes of this invention.

The drawings are considered as being merely exemplary, and are illustrations solely for the purpose of providing an understanding of the invention.

The full scope and spirit of the invention is to be interpreted with reference to the appended claims.

What is claimed is:

1. A combination locking system of the type having a tape containing a plurality of predetermined reference combinations serially disposed thereon, said tape being advanced to a new reference combination position for each unlocking operation performed upon said system, a new combination being entered into said locking system for each unlocking operation, which newly entered combination being required to complement a new predetermined reference combination which has been advanced upon said tape in order to unlock a lock of said locking system, the combination locking system comprising:

sensing means for sensing the reference combination appearing on the tape adjacent said sensing means and comparing said reference combination with said entered combination;

tape driving means associated with said sensing means for positively advancing the tape past said sensing means thereby moving successive reference combinations past said sensing means, said positive tape driving means comprising at least one sprocket wheel, an actuating mechanism operatively connected to said sprocket wheel for positively turning said sprocket wheel, said tape being in contact with said sprocket wheel and aperatured to conform to said sprocket wheel, said tape being advanced by said sprocket wheel when said actuating mechanism turns said sprocket wheel;

positioning means operatively connected to said driving means for incrementally positioning a new reference combination adjacent said sensing means with each actuation of said positioning means; and

means operatively connected to said positioning means for actuating said positioning means in response to the complementing of the reference combination with the entered combination.

2. The combination locking system of claim **1**, wherein said actuating mechanism comprises a hand-held knob operatively connected to said sprocket wheel for turning said sprocket wheel.

3. The combination locking system of claim **1**, wherein said positioning means comprises an intermittent motion mechanism operatively connected between said sprocket wheel and said actuating mechanism for incrementally advancing said tape one reference combination for each actuation of said actuating mechanism.

4. The combination locking system of claim **3**, wherein said intermittent motion mechanism comprises a Geneva stop mechanism.

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