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3,427,441 2/1969 Swords..... 235/92

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[54] **CALCULATING DEVICE FOR A DUPLICATOR**
5 Claims, 3 Drawing Figs.

[52] U.S. Cl..... 235/91,
235/132
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G06f 15/18
[50] Field of Search..... 235/92
(Mag), 132, 91; 355/14, 12, (Inquired); 235/92.1

[56] **References Cited**

UNITED STATES PATENTS

1,908,626	5/1933	Ford.....	235/132X
2,433,608	12/1947	Handley	235/92
3,229,908	1/1966	Niesen et al.	235/132

ABSTRACT: A calculating device for a duplicator comprises a first driving ratchet wheel fixed to a shaft of a calculating meter and a second ratchet wheel loosely mounted on the shaft. The second ratchet wheel is urged by a spring to an initial predetermined position and a pawl is positioned adjacent the ratchet wheels to drive them each time a copy of an original is made by the duplicator. Each time the pawl is driven, each of the ratchet wheels is rotated through one tooth. The second ratchet wheel has a protruded toothless portion to engage the pawl after a predetermined rotation of the second ratchet wheel in order to prevent engagement of the pawl with the driving ratchet wheel. Consequently the calculating meter will only indicate the number of copies made up to a predetermined number. A retaining pawl engages the second ratchet wheel to prevent return thereof to its original position until an original to be copied is replaced in the duplicator by another original.

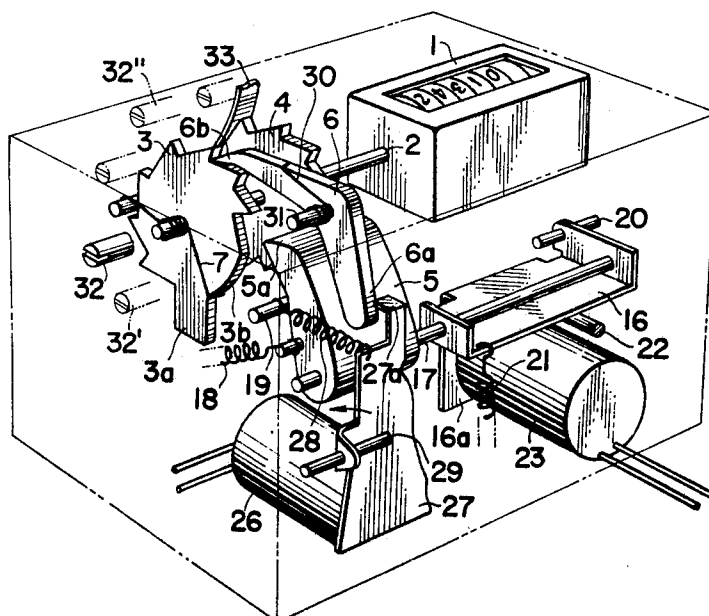


FIG. 1

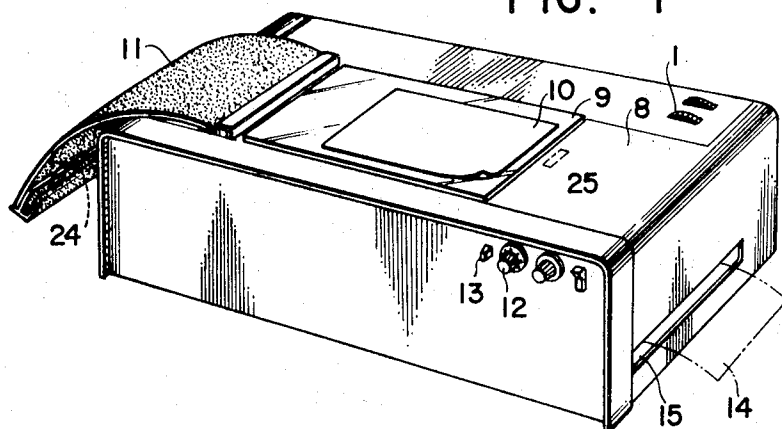


FIG. 2

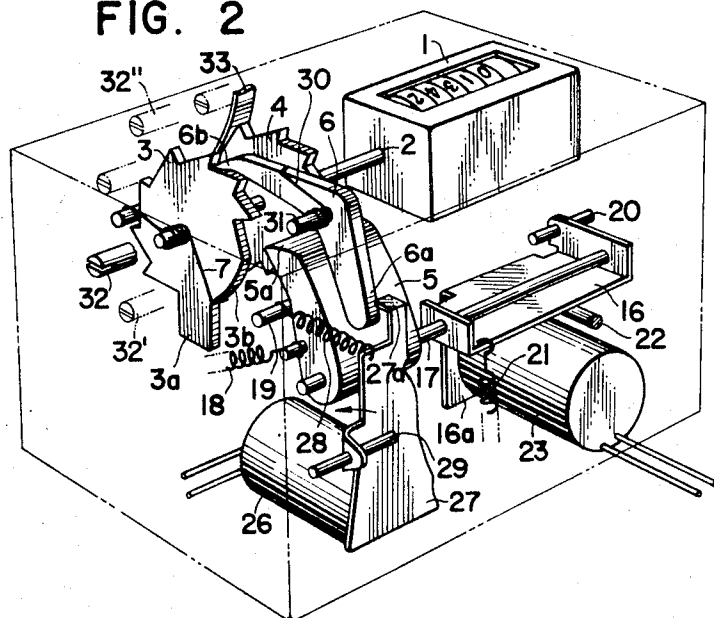
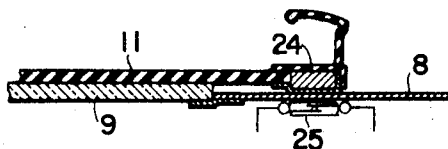


FIG. 3



CALCULATING DEVICE FOR A DUPLICATOR

The present invention relates to a calculating device for a duplicator.

In renting a duplicator to a user on a lease basis, the rent is frequently by the number of copies obtained in the duplicator. The following system has sometimes been adopted to determine the rental cost in making a number of copies of one original, the expense for each of a first fixed number of copies, for example, the first two copies, is more than that for each of the third copy and thereafter, that is, the unit price of the copies after a certain number, predetermined by both parties concerned, for instance, all copies after the first two, namely, the third copy and thereafter, are discounted as compared to that of the first two copies.

Assuming herein that the price of each of the first two copies is 10 cents and that the price of each of the third copy and thereafter is 8 cents, in the case of making one copy of an original A, two copies of an original B, three copies of an original C, and four copies of an original D, the number of all the copies is

$$1+2+3+4=10,$$

the number of the copies which cost 10 cents is

$$1+2+2=7,$$

and accordingly, the expense in this case amounts to 94 cents.

This sum of 94 cents is calculated according to the following relation,

$$(\text{number of all copies } 10 \times 8 \text{ cents}) + [\text{sum of first fixed number of copies } 7 \times (10 \text{ cents} - 8 \text{ cents})] = 94 \text{ cents},$$

which is shown with the following general expression,

$$N \times p \times n \times (P - p)$$

wherein N is the number of all the copies, n is the sum of the first fixed number of copies, P is the unit price of the first fixed number of copies and p is the unit price of the copies after the first fixed number of copies.

To calculate the rental easily, as seen in the above expression, it is necessary to record the number of all the copies and the sum of the first fixed number of copies separately in the calculating device in the duplicator.

The above-mentioned number of all the copies is indicated by a device called a totalizer, while the sum of the first fixed number of copies is indicated by a copymeter. In the case of the above embodiment, the totalizer indicates 10 and the copymeter indicates 7, respectively. The present invention relates to a calculating device corresponding to the above-mentioned copymeter.

For a better understanding of this invention, reference is made to the following detailed description of this invention taken in conjunction with the accompanying drawing wherein:

FIG. 1 is a perspective view showing an embodiment of a duplicator provided with the present device;

FIG. 2 is a perspective view of the calculating device according to this invention; and

FIG. 3 is an enlarged sectional view of a part of an holding member for an original.

The calculating device of this invention, as shown in FIG. 2, is mounted for free rotation on a shaft 2 of a calculating meter 1 which indicates the calculated number of the first fixed number of copies, and comprises a rotatable index ratchet wheel 3 which rotates from a fixed initial position in the range of a fixed predetermined angle, a calculating meter driving ratchet wheel 4 secured to shaft 2, a pawl 5 which engages both ratchet wheels 3 and 4 so as to rotate them simultaneously every time a copy is obtained, a retaining pawl 6 which releases itself from ratchet wheel 3 in connection with the operation of removing the original from the duplicator, a spring 7 which rotates the ratchet wheel 3 back to its initial position, and means for actuating pawls 5 and 6 to be explained later. As shown in FIG. 1, in a well-known automatic duplicator provided with a holding member 11 for pressing an original 10 against a transparent table 9 secured at a top plate 8, this calculating device is provided with a repeat means wherein a designated number of copies to be successively made of an original is preset by a dial 12 and afterward a start-

ing button 13 is pushed so as to obtain the preset number of copies automatically. The above-mentioned original 10 is reproduced on printing paper cut from a roll of printing paper at a designated length, and a copy 14 is discharged from the duplicator through a horizontal slit 15.

In FIG. 2 the pawl 5 is loosely mounted on a shaft 17 secured to a pivotal plate 16 and pawl 5 is urged in counterclockwise rotation around shaft 17 by the elasticity of a spring 18. The rotation is restricted by a pin 19 fixedly secured in the duplicator. The plate 16, loosely supported by a fixed shaft 20, is urged in rotation around shaft 20 by a spring 21. This rotation is restricted by a stopper 22. In the state in which stopper 22 is engaged against plate 16, a finger 5a of pawl 5 is at a position outside the tooth edges of the two ratchet wheels 3 and 4, and the ratchet wheel 3 is allowed to rotate back to its initial position when the retaining pawl 6 is released from ratchet wheel 3, as will be explained later. The plate 16 causes pawl 5 to reciprocate as a sleeve plate 16a is attracted by an electromagnet 23 which is excited every time a copy is obtained, and whenever pawl 5 is given one stroke of reciprocation, plate 16 rotates each of the ratchet wheels 3 and 4 by one tooth. Electric signals which activate electromagnet 23 are obtained with the action of a cutter which cuts a designated length of printing paper from the roll. If the pawl 5 is to be reciprocated without the use of an electromagnet, plate 16 is pivoted against the elasticity of the spring 21 by a member which reciprocates in connection with the action of said cutter.

A magnet 24 is provided at a part of the free end of holding member 11 with the other end thereof hinged at the top plate 8 of the duplicator. Inside top plate 8 is mounted a lead switch 25, which is arranged so as to be inside the magnetic field of said magnet 24 when holding member 11 is put on the table 9. When the lead switch 25 is closed by putting the holding member 11 at its operative position, an electromagnet 26 is excited and a pivotal member 27 is caused to rotate around a shaft 29 against the elasticity of a spring 28. FIG. 2 shows the state wherein electromagnet 26 is excited and attracts the member 27. When the electromagnet 26 is demagnetized, that is, when the magnet 24 (see FIG. 3) is separated from the lead switch 25, the member 27 rotates in the direction shown by the arrow under the elasticity of the spring 28, and an end 6a of the retaining pawl 6 is pushed in, against the elasticity of a spring 30, by a bent part 27a of member 27. The pawl 6, accordingly, is rotated around a shaft 31 on which pawl 6 is journaled and its finger 6b is separated from the ratchet wheel 3. The ratchet wheel 3, whose rotation has been restricted by pawl 6, is released and rotated back by the spring 7 to the position wherein the arm 3a of ratchet wheel 3 is stopped by a stopper 32. In order to prevent ratchet wheel 4 from being rotated by the friction force when ratchet wheel 3 is rotated back, a spring 33 is engaged with ratchet wheel 4 to prevent reverse movement thereof.

In the condition in which the ratchet wheel 3 and the pawl 5 are in the relative positions shown in FIG. 2, even if pawl 5 is operated, its finger 5a will only slip along a toothless protruding part 3b of the periphery of the ratchet wheel 3 and remain out of engagement with the teeth of ratchet wheel 4, and therefore, neither of the ratchet wheels will be given any rotation. After the ratchet wheel 3 is thus rotated in the range of the fixed angle, that is, after the first fixed number of copies are obtained, the calculating meter 1 will not be operated even if the pawl 5 operates.

After the designated number of copies are made from one original, when the holding member 11 is opened as shown in FIG. 1, the lead switch 25 is opened and the electromagnet 26 is deenergized, whereupon the pawl 6 is released from the ratchet wheel 3 so that ratchet wheel 3 is allowed to rotate back to its original position.

The angle of rotation back of ratchet wheel 3 determines how much the pawl 5 will subsequently rotate the wheel 3 from its initial position. For example, when the stopper 32 is put at the position shown at chain line 32', the ratchet wheel 3

is rotated back by one tooth from the illustrated position. Accordingly, the quantity that ratchet wheel 3 will be rotated by the pawl 5 is only one tooth. When the stopper 32 is shifted to the position shown at chain line 32'', the ratchet wheel 3 is rotated back by an angle corresponding to four teeth from the illustrated position.

The calculating meter 1, as described above, indicates the sum of the copies of the first fixed number predetermined between the owner and the user of the duplicator in the lease. The position of the stopper 32 in FIG. 2 gives two teeth of rotation to the ratchet wheel 3. In this case, two is the predetermined number between both parties concerned as the first fixed number of the copies.

The inventor of the present invention has proposed a calculating device wherein at the same time of the completion of operation of the repeat means, namely, at the same time that a designated number of copies are made of one original, the pawl 6 which prevents the ratchet wheel 3 from rotating back is released from ratchet wheel 3 so that ratchet wheel 3 is rotated back to its initial position. This calculating device, however, has the following defect.

That is to say, although the number of the copies to be made of one original A is set by the repeat means, for example, ten, after two copies of the first fixed number of copies are obtained, changing original A to another original B, all the copies (eight copies) made of the original B, are discounted. Namely, in spite of the two different originals A and B, it is only the first fixed number of copies made of the original A that is indicated in the calculating meter, and the first fixed number of copies are made of the original B is not added in the calculating meter. This is undesirable and is overcome by the present invention because the ratchet wheel 3 is rotated back

to its initial position every time the originals are changed.

I claim:

1. A calculating device for a duplicator comprising a driving ratchet wheel fixed to a shaft of a calculating meter, a second ratchet wheel loosely mounted on said shaft, means acting on the second ratchet wheel to urge the same to an initial predetermined position, and a pawl driven each time a copy of an original is made by the duplicator to rotate each of said ratchet wheels through one tooth for each copy, said second ratchet wheel having a protruded, toothless portion to engage said pawl after a predetermined rotation of said second ratchet wheel and prevent engagement of the pawl with the driving ratchet wheel.

2. A calculating device as claimed in claim 1 further comprising a retaining pawl engaging the second ratchet wheel to prevent return thereof to its original position, and means for releasing the retaining pawl each time an original to be copied is replaced in the duplicator.

3. a calculating device as claimed in claim 2 wherein said means for releasing the retaining pawl comprises an actuating member for acting on said retaining pawl, an electromagnetic controlling the operation of said actuating member, and means for operating said electromagnet when an original to be copied is replaced.

4. A calculating device as claimed in claim 3 wherein said means for operating the electromagnet comprises a magnetic switch controlled by the operation of a holding plate for an original.

5. A calculating device as claimed in claim 1 comprising adjustable means for regulating said predetermined position of said second ratchet wheel.

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