United States Patent [19]

Wagner

[11] **3,884,341**

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[54] **PAPER STRIP TRANSPORT AND PRINTING MECHANISM HAVING A COMMON DRIVE**

[75] Inventor: **Heinz-Gunter Wagner**, Berlin, Germany

[73] Assignee: **Siemens Aktiengesellschaft**, Munich, Germany

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[52] **U.S. Cl.** ..... **197/133 R**; 101/45; 101/288

[51] **Int. Cl.** **B41j 15/00**

[58] **Field of Search** ..... 197/133 R, 127 R; 101/45, 101/57, 59, 61, 64, 65, 69, 93 R, 93 C, 93 MN, 94–102, 195, 197, 200, 201, 287–289, 291, 292, 296–300, 306, 316

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Primary Examiner—Ernest T. Wright, Jr.

Attorney, Agent, or Firm—Kenyon & Kenyon Reilly Carr & Chapin

[57] **ABSTRACT**

A paper strip transport and printing mechanism includes means for feeding forwardly a paper strip taken from a supply source, means positioned in front of this feeding means for printing on the strip and means for actuating the feeding means and the printing means, this actuating means comprising a single driving means, which may be manually operated, and a system for connecting this drive means with both the feeding and printing means, this system being positively mechanically timed to first actuate the feeding means and thereafter the printing means in succession, to avoid printing on the strip more than once at the same place on the strip.

9 Claims, 4 Drawing Figures

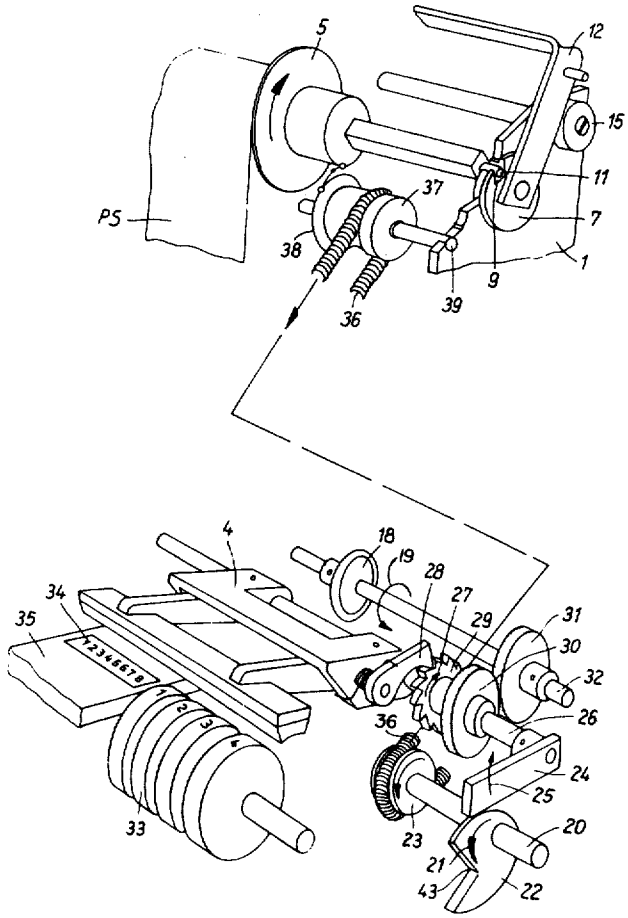


Fig. 1

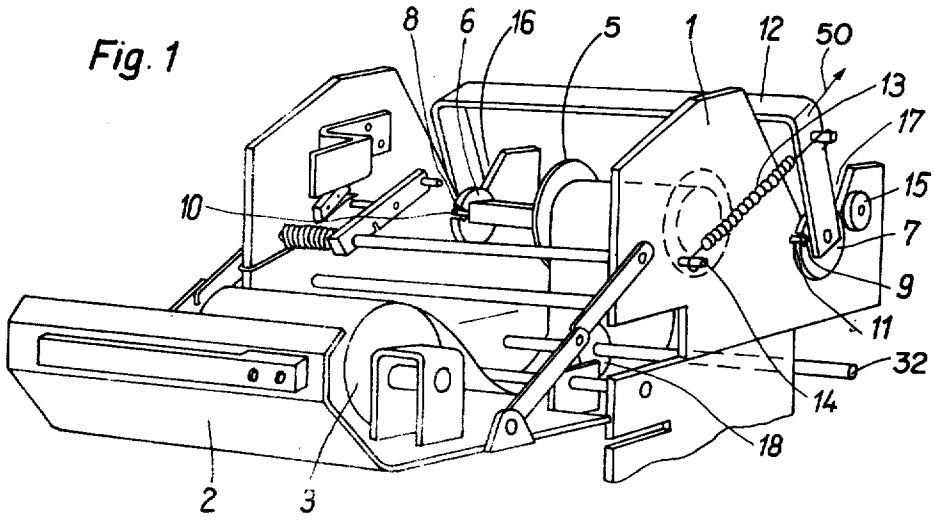
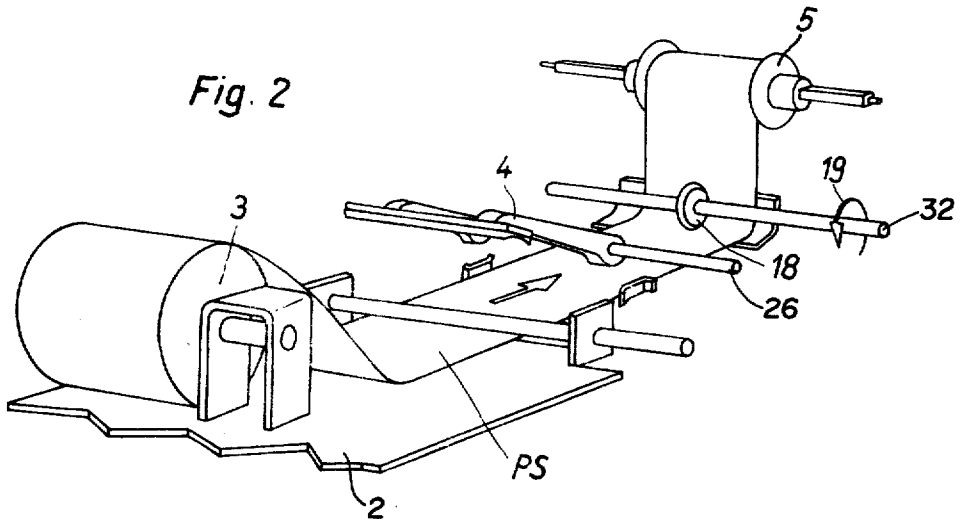


Fig. 2



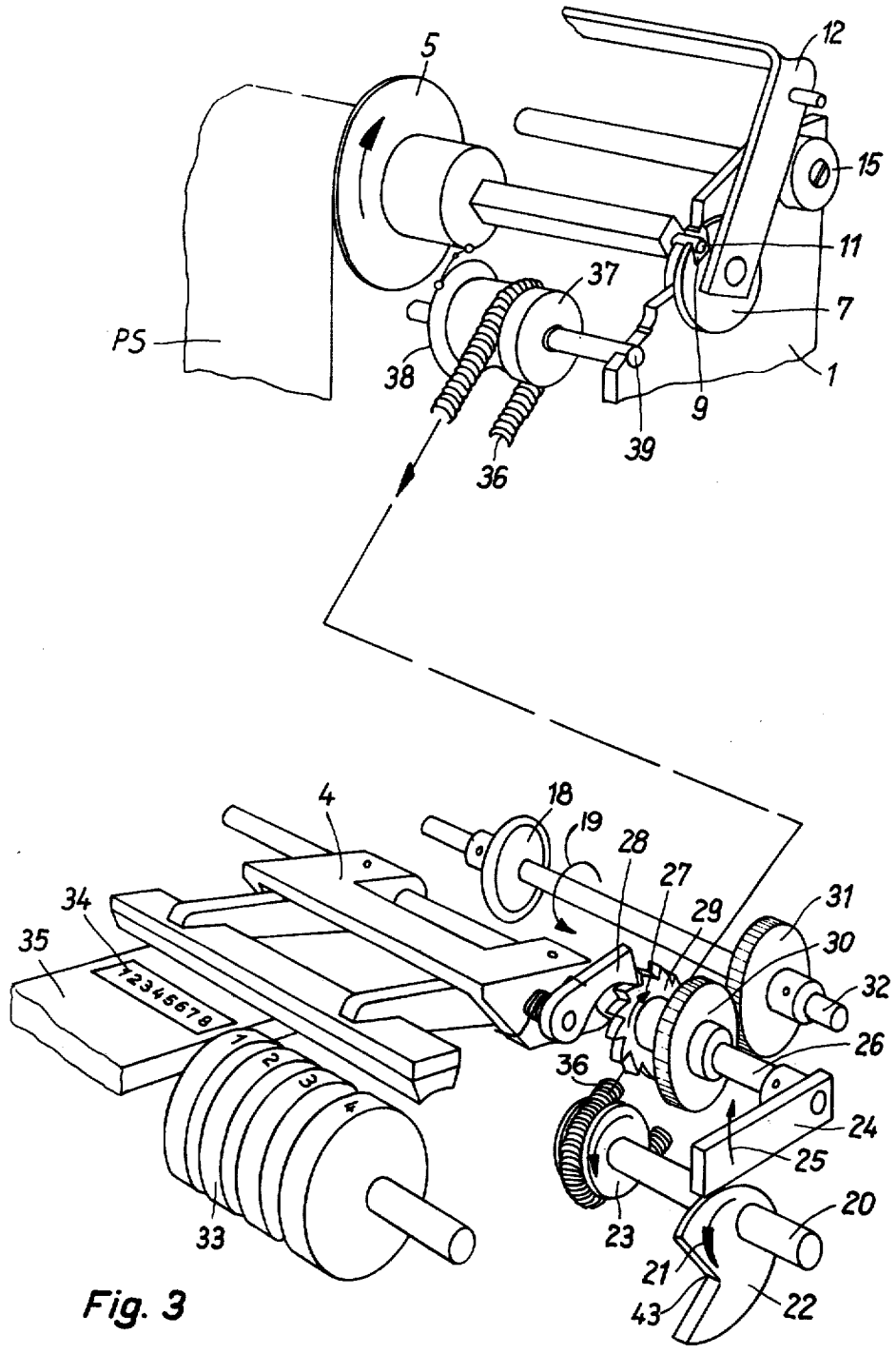

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PS
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34
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35
32
12345678
26
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Fig. 3

PAPER STRIP TRANSPORT AND PRINTING MECHANISM HAVING A COMMON DRIVE

BACKGROUND OF THE INVENTION

This invention relates to paper strip transport and printing mechanisms such as may be used to keep a record of the automatic dispensing of fluids, or other record-keeping purposes.

To exemplify, such a mechanism may be included in the construction of a device in which an identifying type-carrying key or credit card or the like, may be inserted, actuation of the device transferring the type indicia on the key or card onto a paper strip which must be advanced for each printing operation, the strip being rolled up to form a roll bearing a record of the various transactions, spaced along its length.

If repeat printing on the same location of the strip inadvertently occurs, the desired record-keeping is, of course, obfuscated, with possible serious business consequences. Therefore, the strip feeding and printing mechanism involved should be very reliable.

An example of a prior art device of the type described is shown by German Design Pat. No. 1,863,015. However, this patent does not disclose clearly the manner in which the paper strip is fed and the printing operation effected.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a paper strip transport and printing mechanism which is mechanically operated in the interest of maximum reliability and which assures that printing impressions will not be made repeatedly at the same location on the paper strip.

According to this invention, this object is attained by a mechanism including means for feeding forwardly a paper strip taken from a supply source such as a roll of the unprinted strip, this means preferably being a rotary feed roll which firmly engages the strip. Printing means are positioned in front of this feeding means for printing on the strip and this means may be a swinging hammer platen which presses the strip against the type-carrying key or card or the like, the printing being accomplished in the manner that the type on credit cards is printed on the charge records which are retained after the printing operation, with the card being returned to the person involved. There must, of course, be a means for actuating the feeding means and the printing means.

In the present instance this actuating means comprises a single drive means, which may be a manually turned rotative shaft, and means, forming separate but interlocked motion transmission paths, for connecting this actuating means with both the strip feeding means and the printing means. This connecting means is timed to first actuate the feeding means and thereafter the printing means in succession, thus assuring against repeat impressions or printing, one on top of the other, on the same portion of the paper strip.

A feed roller is used for the strip feeding means to assure that uniform lengths of the strip are fed during each feeding operation and the printing means or hammer platen is actuated by a rotatively reciprocative shaft operated by a cam follower working on a cam actuated by the rotative drive shaft. Each time the rotative shaft is turned for one revolution, the printing means is actuated to perform its printing operation, the hammer platen being raised and then forced down to print. The rotatively reciprocative shaft which actuates the printing means carries a pawl which engages a ratchet wheel which, in turn, is positively connected by a gear train with the feed roll.

Now it can be seen that each time the mechanism's actuating shaft is rotated once, the printing means' rotatively reciprocative shaft goes through a reciprocative cycle with its pawl actuating the ratchet to turn the paper feed roll positively prior to operation of the printing means. Being entirely mechanical, and with the two motion transmitting paths carried by positive interengaging parts, it is impossible for the mechanism to make repeat printings. For each operation the printing hammer platen is given a motion to ready it for printing while the feed roller is positively operated, the platen then moving reversely to effect the printing operation.

BRIEF DESCRIPTION OF THE DRAWING

A preferred embodiment of the invention is illustrated by the accompanying drawing in a somewhat schematic manner, the various figures being as follows:

FIG. 1 is a perspective view of a device incorporating the mechanism of the present invention;

FIG. 2 in perspective shows the paper strip traveling path; and

FIG. 3 in perspective shows the system providing the two motion transmission paths.

DESCRIPTION OF THE PREFERRED EMBODIMENT

As shown by FIG. 1 the mechanism of the present invention is supported within a housing 1 having a removable cover 2 on which a supply roll 3 of paper strip PS is rotatively mounted. As shown by FIG. 2, the paper strip PS is pulled from the roll 3, travels beneath an arcuately reciprocative printing hammer platen 4 and is ultimately wound on a take-up roll 5. This take-up roll 5 is mounted in laterally interspaced support disks 6 and 7, the disks 6 and 7 having radial slots 8 and 9, respectively, which receive the journal bearings 10 and 11 respectively, of the take-up roll 5.

As further shown by FIG. 1, the support disks 6 and 7 are interconnected by a bracket 12 connected to one end of a spring 13 whose other end is anchored on a pin 14 mounted on the housing 1, this biasing the bracket 12 to its rest position shown in FIG. 1 and which it occupies when the mechanism is operating. To remove the take-up roll 5 for replacement by another one, the bracket 12 is swung in the direction of the arrow 50 to a stop 15, this rotating the support disks 6 and 7 correspondingly so that their slots 8 and 9, now in cut-outs 16 and 17 of the housing 1, permit the take-up roll 5, together with its journal bearings 10 and 11, to be removed. This is illustrated by FIG. 3 where the bracket 12 is in its swung-out position.

Referring again to FIG. 2, a feed roller 18 is positioned between the supply roll 3 and the take-up roll 5, this feed roller 18 being arranged behind the printing mechanism with respect to the traveling direction of the paper strip PS; in other words, the printing hammer platen 4 is in front of the feed roller 18 and the take-up roll 5. The printing mechanism includes this printing hammer platen 4. In FIG. 2 this printing hammer platen 4 is shown in its cocked position ready to make its printing stroke; and while it was being moved to this

cocked position, the feed roller **18** was rotated in the direction of the arrow **19** to feed the paper strip PS forwardly, as explained below.

Referring now to FIG. **3**, in particular, the manually turned shaft **20**, turned in the direction of the arrow **21**, turns a rotative cam **22** and also a drive pulley **23**. A cam follower **24**, in the form of a lever, rests on the cam **22** normally in a recess **43** of this cam **22**, and with rotation of the cam **22** the follower **24** is swung in the direction of the arrow **25**. This cam follower **24** is keyed to a shaft **26** which is rotated in the direction of the arrow **27** so as to cock the printing hammer platen **4** in an upward position ready for its printing operation, the printing hammer platen **4** also being keyed to shaft **26**. For printing, the weight of the printing hammer platen **4** and of the cam follower **24** may be used for the printing impression although preferably a spring means would be used (not shown). The printing hammer platen **4** at a location radially displaced from the axis of the shaft **26** carries a spring-biased pawl **28** which cooperates with a ratchet wheel **29** which is rotatively or freely journaled on the shaft **26**. This pawl and ratchet drive is oriented so that as the shaft **26** is turned to raise or cock the printing hammer platen **4**, the ratchet wheel **29** is rotated, while standing stationary when the printing hammer platen **4** falls to effect its printing operation. This ratchet wheel **29** drives a gear **30** which is in mesh with a gear wheel **31** keyed to a shaft **32** on which is keyed the feed roller **18**.

It can be seen that the single drive means formed by the rotative shaft **20**, is connected with both the printing hammer platen **4** and the feed roller **18** through the separate but interlocked paths, and that the timing is such that when the printing hammer platen **4** is raised by action of the cam **22** and the cam follower **24**, the feed roller **18** is driven through its transmission path comprising the ratchet and pawl drive and the two gears **30** and **31**. The printing hammer platen **4** cannot be cocked or raised without the paper feeding first. The motion of the printing hammer platen **4** is through its own transmission path comprising the shaft **26** to which the printing hammer platen **4** is keyed. The timing of the sequential operations is positively fixed by the mechanical elements. When the printing hammer platen **4** falls to effect printing, the pawl **28** merely rides backwardly over the ratchet wheel **29** without turning the latter.

In the lower portion of FIG. **3**, the paper strip PS is not shown. Its path of travel is under the printing hammer platen **4** and above a type wheel **33** and printing type **34** on a removable key **35**. Therefore, when the printing hammer platen **4** falls due to the cam follower **24** dropping into the starting recess **43**, the printing is effected on the paper strip PS. Complete details of this printing operation are not required for an understanding of the present invention.

The drive pulley **23** keyed to this shaft **20**, through a belt **36** drives a pulley **37** which rotatively drives a friction wheel **38** on a shaft **39**, this friction wheel **38** frictionally engaging the take-up roll **5** if the bracket **12** is in its forward or operable position when the take-up roll **5** cannot be removed and the device is in operating condition.

It follows that each time the drive shaft **20** is rotated the friction wheel **38** attempts to overdrive the take-up roll **5** while slipping relative thereto, this action assuring complete rolling of the printed paper strip PS in a tight manner regardless of changes in the diameter of the take-up roll **5** as it builds up in diameter with printing operations. The feed roller **18** engages the paper strip PS directly and, therefore, accurately feeds a predetermined amount each time it is needed, regardless of the diameter of the take-up roll **5**.

It can be seen from the foregoing that from a single drive motion transmission paths are provided which are mechanically locked together so as to be completely reliable, which provide accurate timing with the paper strip PS being fed as printing mechanism is cocked or ready for operation, that the printing hammer platen **4** cannot be cocked without the paper strip PS being fed, and that only after the paper strip PS is fed accurately, can the printing hammer platen **4** fall to effect a printing operation.

What is claimed is:

1. A paper strip transport and printing mechanism comprising: a supply source for supplying paper strip; take-up means for taking up the paper strip; feeding means for feeding forwardly the paper strip taken from said supply source, said feeding means including a feed-roller engaging the paper strip, and a feed-roller gear rigidly connected to said feed-roller; printing means positioned in front of said feeding means for printing on said paper strip; and, actuating means for actuating said feeding means, said printing means and said take-up means, said actuating means including: a single drive means, first transmission means for operatively connecting said drive means to said printing means to actuate said printing means, said first transmission means including ancillary transmission means for actuating said feeding means in a predetermined time relation to the actuation of said printing means, and, second transmission means for connecting said drive means with said take-up means to actuate said take-up means to take up the paper strip moved forward by said feeding means, said first transmission means including a first shaft keyed to said printing means, and cam-follower means operatively connecting said drive means to said first shaft for imparting thereto a reciprocative motion in response to a movement of said drive means; and, said ancillary transmission means comprising a ratchet wheel rotatively mounted on said first shaft so as to be freely rotative with respect thereto, said ratchet wheel being equipped with a gear wheel for engaging said feed-roller gear, and a pawl for coacting with said ratchet wheel, said pawl being operatively connected to said first shaft so as to be actuated by the reciprocative motion of said first shaft to turn said ratchet wheel in a direction for turning said feed-roller in a direction to feed the paper strip forward.

2. The mechanism of claim **1**, said second transmission means including means for frictionally engaging said take-up means so as to cause said take-up means to take up the paper strip while simultaneously keeping the paper strip taut irrespective of the quantity of paper strip taken up thereby.

3. The mechanism of claim **1**, said drive means comprising a rotatable drive shaft; said take-up means being a take-up roller for rolling up the paper strip fed by said feeding means whereby a paper-strip roll of changing diameter builds up on said take-up roller; and, said second transmission means comprising: a drive wheel connected to said drive shaft, a friction wheel, and a belt for connecting said drive wheel to said friction wheel for driving the said friction wheel, said friction wheel

frictionally engaging said take-up roller so as to overdrive said take-up roller whereby the paper strip rolled onto said take-up roller is kept taut regardless of changes in the diameter of the paper-strip roll rolled thereon.

4. The mechanism of claim **3** comprising means for pressing said take-up roller against said friction wheel and for accommodating the take-up roller to facilitate the removal of a printed strip roll.

5. The mechanism of claim **3,** wherein said reciprocative motion of said first shaft operates to move said printing means between first and second positions whereat said printing means prints on and is separated away from the paper strip respectively, said pawl engaging the teeth of said ratchet wheel during the movement of the printing means from said first position to said second position whereby said feed-roller is actuated to move the paper strip forward in time sequence ahead of the movement of said printing means from said second position to said first position to print on the paper strip.

6. The mechanism of claim **5** comprising means for pressing said take-up roller against said friction wheel and for accommodating the take-up roller to facilitate the removal of a printed strip roll.

7. The mechanism of claim **1,** said drive means comprising a rotatable drive shaft, a cam-disc mounted on said drive shaft, and a cam-follower connected to said first shaft whereby the reciprocative motion of said first shaft is produced in response to a unidirectional rotative motion of said cam-disc.

8. The mechanism of claim **1,** wherein said reciprocative motion of said first shaft operates to move said printing means between first and second positions whereat said printing means prints on and is separated away from the paper strip respectively, said pawl engaging the teeth of said ratchet wheel during the movement of the printing means from said first position to said second position whereby said feed-roller is actuated to move the paper strip forward in time sequence ahead of the movement of said printing means from said second position to said first position to print on the paper strip.

9. The mechanism of claim **8,** said drive means comprising a rotatable drive shaft, a cam-disc mounted on said drive shaft, and a cam-follower connected to said first shaft whereby the reciprocative motion of said first shaft is produced in response to a unidirectional rotative motion of siad cam-disc.

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