Aug. 4, 1964 C. H. VANN 3,143,064

PRINT HAMMER ANTI-REBOUND MECHANISM

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FIG. 1

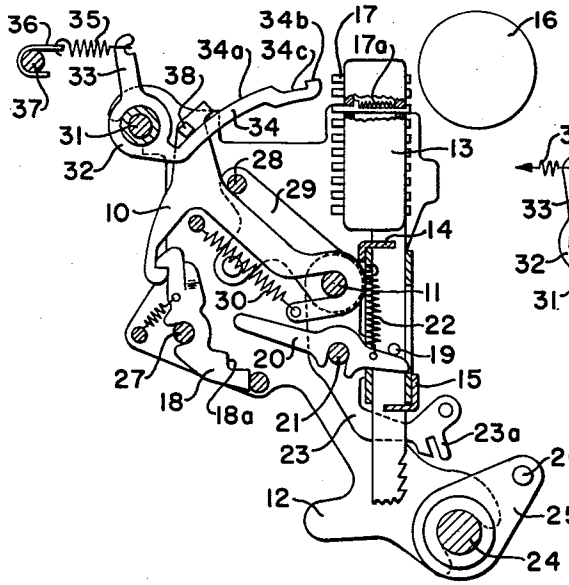


FIG. 2

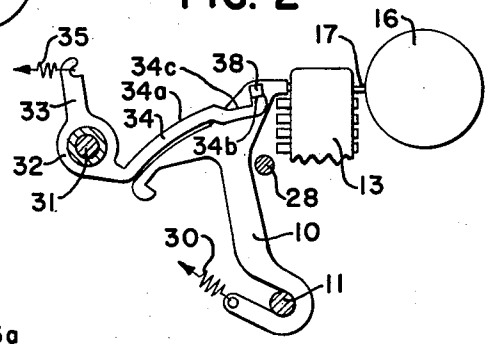
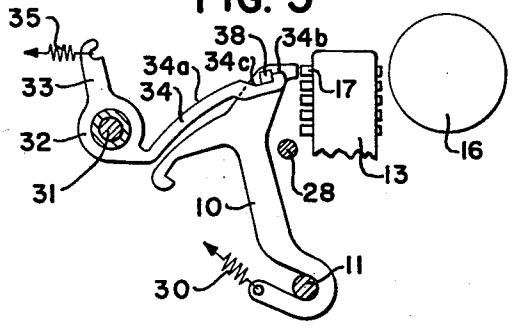


FIG. 3



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PRINT HAMMER ANTI-REBOUND MECHANISM

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This invention relates generally to an improvement in means to prevent rebound of print hammers used in cash registers, calculating, and like machines. More particularly, the invention relates to an improved anti-rebound mechanism adapted to spring-actuated impression or print hammers of the kind used in machines of the type shown and described in United States Letters Patent No. 2,666,574, issued to Carl H. Carlson et al., on January 19, 1954.

In the printer construction shown and described in such Carlson et al. patent, the essential portion of which is further illustrated and described herein, the print hammer is actuated by a powerful spring, which when released, forces the hammer against a type carrier with a sudden blow. With such construction, when the hammer completes its full printing stroke, it reacts against the driving spring, which tends to cause such hammer to rebound, and in some instances, this rebound is of sufficient magnitude to cause a second or "ghost" impression to be made. As can be understood from the patent to Shipley, No. 1,652,057; the patent to Robertson, No. 2,117,451; and the patent to Williams et al., No. 2,625,100, as examples, numerous means have been devised to prevent (both through dampening and latching) spring-actuated print hammers from rebounding after making a printing stroke. All of such mechanisms, while being effective in their performance of the desired task, comprise not only a plurality of parts, but require definite space commitments to be made therefor in the overall printer construction. This, of course, adds both to the problems of assembly and to the cost factor of a machine employing same. Contrary to this, in the present application a single latch pawl is operably associated in such a way with a spring-actuated print hammer that any possible rebound thereof is positively prevented after each printing stroke, thereby avoiding blurred impressions caused by an overprinting due to the hammer striking the type carrier the second time.

Thus, the principal object of this invention is to provide an extremely simple, yet very effective mechanism to prevent rebound of spring-actuated print hammers.

A further object of the invention is to provide such a mechanism which, without the use of any great number of tools and the like, may be quickly and easily adapted to printer constructions employing either print hammers or printing platens of the spring-actuated type.

Still a further object of the instant invention is to provide such a mechanism of extremely low cost, both in its manufacture and in its assembly both to new and in-service machines.

With these and incidental objects in view, the invention includes certain novel features of construction and combinations of parts, the essential elements of which are set forth in appended claims and a preferred form or embodiment of which is hereinafter described with reference to the drawing which accompanies and forms a part of this specification.

Of said drawing:

FIG. 1 is a side elevation of a printer unit of the spring-actuated hammer type embodying the instant invention, the hammer being illustrated therein in the position which it assumes just before being released for a printing stroke;

FIG. 2 is a detail side view of the print hammer of FIG. 1 as associated with the instant invention when at the end of a printing stroke; and

FIG. 3 is a detail side view of the print hammer of FIG. 1 as associated with the instant invention immediately after the completion of a printing stroke.

General Printer Mechanism

While the present application illustrates only one print hammer **10**, as known from the above-mentioned reference patent to Carlson et al., any number of same may be provided in a side-by-side order, each being rockably carried by a support shaft **11** extending between a pair of printer side frames **12** (one frame only shown herein), and each being aligned with the upper end portion of an associated type bar **13**. As understood from FIG. 1, such type bar **13** is movable vertically in slotted guides **14** and **15** with respect to a resilient paper platen **16**. As illustrated in FIGS. 1, 2, and 3, the upper end portion of such type bar **13** carries a plurality of individual type members **17**. As usual, the lower end portion of such type bar **13** is pivoted to a machine carried differential mechanism (not illustrated herein) so that the digit value being entered into the machine may be represented by a particular type member **17** being moved to a printing position with respect to the paper platen **16**. The actual printing operation is then performed as such type member **17** is struck by its associated print hammer **10** (as illustrated in FIG. 2) when released from a cocked position (as illustrated in FIG. 1) at a precise printing time determined by the tripping of a hammer latch **18** during machine operation.

Referring to FIG. 1, when the type bar **13**, under control of the interconnected differential mechanism, is caused to be raised for presenting a particular type member **17** thereof to printing position, all as described in detail in the hereinabove-referred-to reference Patent No. 2,666,574, a stud **19** thereon enables an interponent **20** to rock counter-clockwise on a bail **21** under urge of a spring **22**. The bail **21** extends between an operating arm **23** and another operating arm, like the arm **23**, secured on the outer ends of the print hammer support shaft **11**, extending between the printer side frames **12**.

Operation of a machine of the type herein referred to is through suitable rocking of a machine rear drive shaft **24**, such as by means of an electric motor or operating handle, which shaft **24** is caused to oscillate first counter-clockwise and then clockwise back to its home position (FIG. 1). As illustrated in FIG. 1, a cam lever **25**, secured on such rear drive shaft **24**, is also rocked first counter-clockwise and then clockwise during a machine operation. With such counter-clockwise rocking of the cam lever **25**, a stud **26** thereon strikes a tail portion **23***a* of the operating arm **23**, shifting the bail **21** and the previously rocked interponent **20** toward a lower step **18***a* of the hammer latch **18**, which thereby is moved clockwise near mid-cycle of a machine operation. As best understood from FIG. 1, such clockwise movement of the hammer latch **18**, which is rockably supported by a further shaft **27** extending between the printer side frames **12**, releases the associated print hammer **10** to the action of a strong spring **30** arranged so as to continually urge such hammer clockwise about the support shaft **11**. As illustrated in FIG. 2, this causes the print hammer **10** to be impelled against that type member **17** which is positioned at the printing line. Although not illustrated herein, the usual journal or other record tape extends between the platen **16** and type member **17** for receiving the selected printed indicia thereon.

Restoring of the print hammer **10** to its cocked position—that is, from that position illustrated in FIG. 2 to that position illustrated in FIG. 1, is through engagement thereof by bail **28** being returned to a home

position just prior to the end of a machine operation. Such bail **28** extends between the free end portions of a pair of hammer restoring arms **29** carried by the hammer support shaft **11**, which arms **29**, through the usual oscillating movement imparted to the operating arms **23** by rocking of the rear drive shaft **24**, are first caused to rock a precise distance clockwise prior to mid-cycle of a machine operation, where the upper bail **28** thereof frees the print hammer **10** for a full (printing stroke) clockwise movement (FIG. 2), and are then caused to be returned counter-clockwise to home prior to the end of a machine operation, where the upper bail **28** thereof positively restores the print hammer **10** to its cocked position (FIG. 1).

With such overall construction and mode of operation, it is apparent that when the hammer **10** makes its printing stroke under normal tension of the strong spring **30**, sharp contact thereof with the selected type member **17**, the normal reaction of the usual type member spring **17***a* urging same away from the platen **16**, and the type member's driving force against the resiliency of the platen **16** all cause said hammer **10** to rebound sharply. That is, while the spring **30** is pretty well spent as of the time the print hammer **10** effects an impression on the machine journal or record tape (FIG. 2), a slight re-stretching of such spring **30** is had at the end of each printing stroke completed by the hammer **10**, which, upon contraction, will tend to cause such hammer **10** to make a second light impression stroke against the type member **17** shifted to the printing position. This second light impression stroke, commonly referred to as a rebound stroke, generally results in a blurring or smudging of the first impression made on the journal or other record material. It is the elimination of this undesirable condition which the present invention overcomes through use of a single pawl associated with each of the print hammers **10**, all in the manner described hereinafter.

Improved Anti-Rebound Mechanism

As disclosed in FIG. 1, each of the printer side frames **12** is supported both by the previously-described machine rear drive shaft **24** and by a second shaft **31** fixedly extending laterally across the machine. Rotatably mounted on such fixed shaft **31**, adjacent each print hammer **10**, is an anti-rebound pawl **32**, having an upwardly extending arm portion **33** and a rearwardly extending tail portion **34**. A spring **35**, stretched between such pawl arm portion **33** and an appropriate hanger **36** carried by a further shaft **37** extending laterally across the machine, yieldingly urges the pawl **32** counter-clockwise that extent permitted by the upper surface of the pawl tail portion **34** coming into engagement with the under surface of a square stud **38** carried by the print hammer **10**. As illustrated, the pawl tail portion **34** is arcuately shaped and has the inner end portion of its upper surface, designated as **34***a*, developed on a common radius which, until the square stud **38** is caused to leave same during each printing stroke of the hammer **10**, maintains the pawl **32** in what may be called an ineffective position with respect to stopping the hammer **10** from striking an aligned type member **17**. That is, as best understood from FIG. 1, the normal positioning of the anti-rebound pawl **32** by the print hammer carried square stud **38**, when such print hammer is in its cocked position, is maintained by surface **34***a* throughout the major portion of each printing stroke made by the hammer. The outer end of such pawl tail portion **34**, being of a length slightly greater than that of the square stud **38**, is provided with an upper surface **34***b* defined by a lesser radius than that of the inner surface **34***a*, which surface **34***b* would, when considered in conjunction with the print hammer **10**, permit the spring **35** to rock the anti-rebound pawl **32** slightly counter-clockwise from the positioning thereof in FIG. 1—until the surface **34***b* comes into contact with the under surface of the hammer carried stud **38**.

Intermediate such pawl tail surfaces **34***a* and **34***b* is a recessed zone **34***c* of the pawl tail portion **34**, being again of a length greater than that of the square stud **38**, being squared at that end thereof merging into the surface **34***b*, and being inclined at that end thereof merging into the surface **34***a*. The overall effect of such configuration of the pawl **32** is that of a hook member having a major length (**34***a*) of one radius, a minor length (**34***b*) of a lesser radius, and an undercut or recess (**34***c*) therebetween with one square wall and one sloping wall.

The overall operation of such an anti-rebound pawl **32** with respect to its associated print hammer **10** is as follows. As set out above, normal positioning of the pawl **32** is that as illustrated in FIG. 1, where the upper surface **34***a* of the pawl tail portion **34** is, through normal tension of the spring **35**, maintained in engagement with the hammer stud **38**. Upon release of the print hammer **10** from its cocked position, in that precise manner described hereinabove, stud **38** thereof is immediately driven along the overall length of the surface **34***a*, and, in view of the great weight of the hammer spring **30**, is permitted to strike the selected type member **17** (as illustrated in FIG. 2) prior to the time that any appreciable extent of counter-clockwise rocking movement is imparted to the anti-rebound pawl **32** through tension of its associated spring **35**. That is, although the spring **35** is free to rock such pawl **32** as soon as the square stud **38** leaves engagement with surface **34***a*, the great speed of travel of the print hammer **10** during its printing stroke will actually permit such stud **38** to clear the pawl recess **34***c* and be positioned above the pawl surface **34***b* by the time that spring **35** causes the pawl **32** to next engage the under surface thereof. This operation, which may be termed a "ski-jumping" of the hammer carried square stud **38** from the pawl surface **34***a* to the pawl surface **34***b* during a printing stroke is best understood from FIG. 2. Essentially, the jumping-over of the pawl recess **34***c* by the square stud **38** during each printing stroke of the hammer **10** is the result of the combined variations both in the weights of the springs **30** and **35** and in the planes of the pawl surfaces **34***a* and **34***b*.

Looking now to the illustration in FIG. 3, when the print hammer **10** recoils from its impact with the selected type member **17**, all in the manner explained above, the square stud **38** thereof will move backward and off the surface **34***b* of the pawl tail portion **34** and into alignment with the recess **34***c* therein, in turn permitting the pawl **32** to rock further counter-clockwise by the spring **35** to the position shown. This presents the squared wall of the recess **34***c* in the path of the square stud **38** to positively block any attempted rebounding movement of the print hammer **10**. Since the strong spring **30** is almost spent at this time, no additional (partial) printing stroke of the hammer **10** can be completed thereby before the spring **35** has had time to impart sufficient rocking movement to the pawl **32** for presenting the recess **34***c* in its hammer blocking position.

As mentioned above, restoring of the print hammer **10** to its cocked position (FIG. 1) takes place during the second half-cycle of a machine operation, which is when the upper bail **28** is returned from that position of FIG. 2 to that position of FIG. 1. When this happens, as can be understood from FIG. 3, the hammer carried square stud **38**, when engaging the inclined wall of the pawl recess **34***c*, will cam the pawl **32** again to its normal, ineffective position. Of course, such positioning of the pawl **32** will be had as long as the stud **38** maintains engagement with the upper surface **34***a* of the pawl tail portion **34**.

Although not so illustrated herein, it is axiomatic that the instant anti-rebound pawl **32**, or one of a quite similar construction, will be just as effective in its operation if same is mounted in a reversed manner—that is, with its surfaces **34***a*, **34***b* and recess **34***c* adapted to engage the upper surface of hammer stud **38**. Complete operation of

the pawl **32** would then be had solely by gravity—due to the sheer weight thereof. This reversal in the mounting of such a pawl **32**, and, of course, also in the stud engaging surfaces and recess thereof, is desirable for those printer constructions not having available either the shaft **37** or the space for a tension spring **35**. Thus, while the form of mechanism herein shown and described is admirably adapted to fulfill the objects primarily stated, it is to be understood that it is not intended to confine the invention to that one form of embodiment precisely disclosed, for it is susceptible of embodiment in various other forms, all coming within the scope of the following claims.

What is claimed is:

1. The combination of a print hammer; a type carrier; means imparting a printing stroke of said hammer with respect to said type carrier for taking an impression therefrom; an abutment on said print hammer; and a unitary pawl member operably associated with said abutment for preventing the print hammer from taking more than one impression from said type carrier during each printing stroke thereof; said pawl member having a control surface cooperating with said abutment throughout a major portion of each printing stroke of the print hammer for maintaining the pawl member ineffective; and said pawl member having a latching surface cooperating with said abutment immediately following the completion of each printing stroke of the print hammer for making the pawl member then effective for restraining said print hammer in a partially retracted position.

2. The structure of claim 1 in which said printing stroke imparting means comprises a spring for impelling the print hammer against said type carrier; said latching surface defines one wall portion of a latch member carried recess; said control surface comprises a first surface portion extending to said recess and a second surface portion extending therebeyond; means for urging both said control surface and said recess toward engagement with said hammer abutment; said control surface first surface portion normally engaging said hammer abutment; and said hammer impelling spring is of a magnitude sufficient to transfer the hammer abutment along said control surface first surface portion, across said recess, and onto said control surface second surface portion during each printing stroke of the print hammer, after which printing stroke the magnitude of said spring decreases to an extent which permits the said recess to engage the hammer abutment during any print hammer rebound from the type carrier.

3. The structure of claim 2 in which the control surface second surface portion is in a plane varying from the plane of the control surface first surface portion.

4. The structure of claim 3 in which said means for urging both said control surface and said recess toward engagement with said hammer abutment is of a magnitude lesser than that of the hammer impelling spring prior to and during each printing stroke of the print hammer, with the magnitudes thereof being reversed thereafter.

5. The combination of a print hammer; a type carrier; means imparting a printing stroke to said print hammer with respect to said type carrier for taking an impression therefrom; a projection on said print hammer; and a unitary pawl member for preventing the print hammer from taking more than one impression from said type carrier during each printing stroke thereof; said pawl member having, one behind another and in the direction of the printing stroke, a first control surface, a latching surface, and a second control surface, all adapted to engage said hammer projection; each of said first and second control surfaces, when engaged with said projection, permitting the print hammer to take an impression from the type carrier; said latching surface, when engaged with said projection, preventing the print hammer from taking an impression from the type carrier; said projection normally engaging the first control surface and maintained in engagement therewith throughout the major portion of each printing stroke of the print hammer; and said print hammer operating at such a speed in the printing stroke to cause said projection to skip over said latching surface and move directly from said first control surface to engagement with the second control surface, after which printing stroke rebound of the print hammer is effective for moving said projection from said second control surface and into engagement with the latching surface.

6. The structure of claim 5 in which said printing stroke imparting means comprises a strong spring for impelling said print hammer against said type carrier; and a further spring of lesser strength continually urges said pawl member in a direction for maintaining one or the other of the control and latching surfaces thereof in engagement with the print hammer projection.

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