March 31, 1964 W. Y. BENSON 3,126,823

PRINT HAMMER ASSEMBLY

Filed May 24, 1962 2 Sheets-Sheet 1

FIG. 1

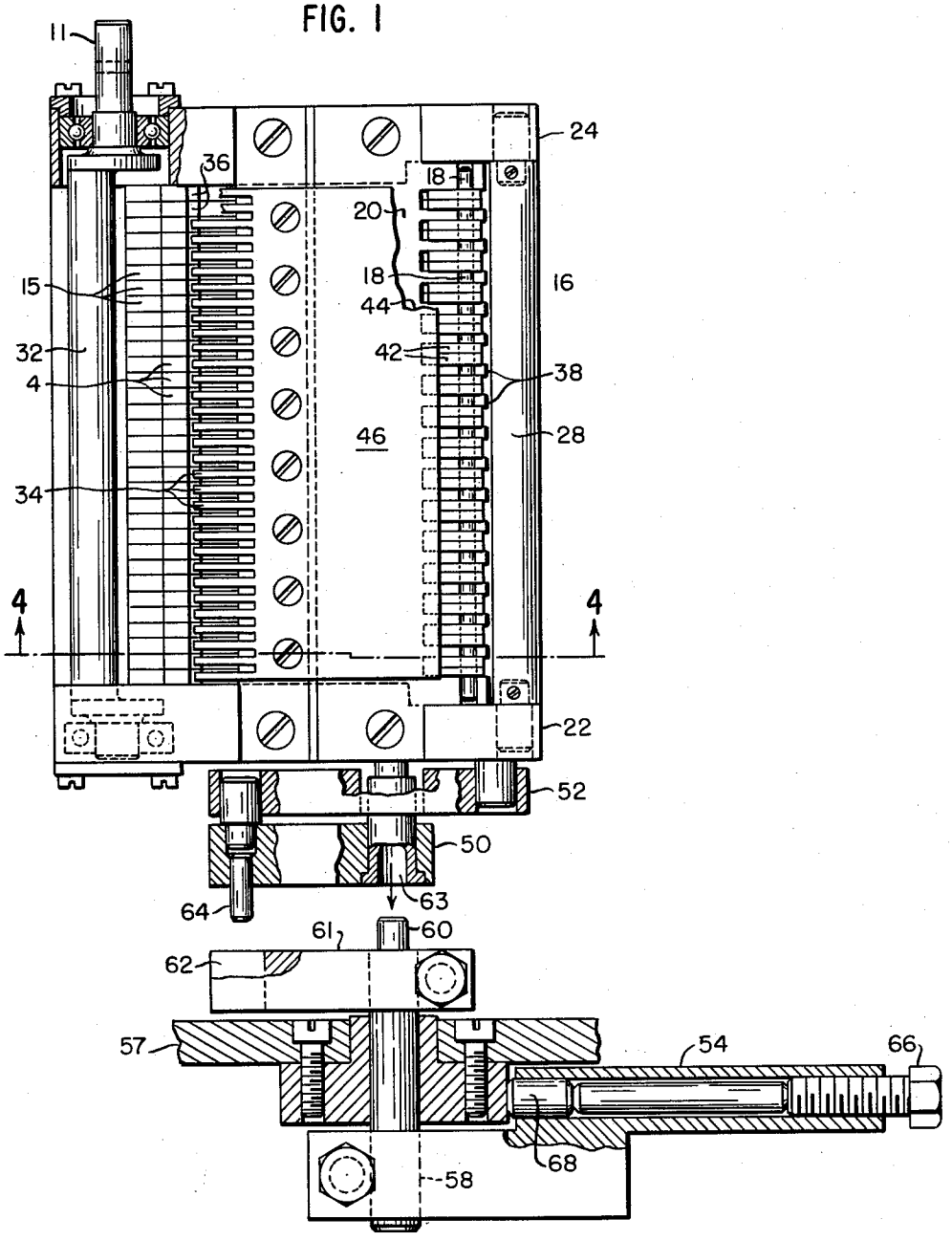

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FIG. 2

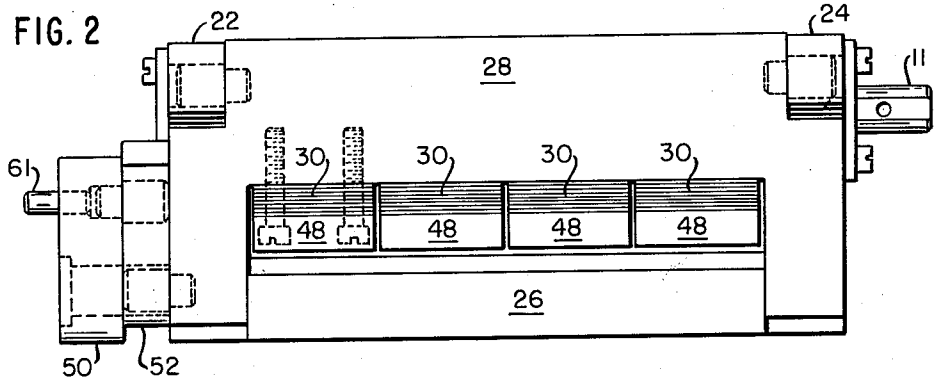


FIG. 3

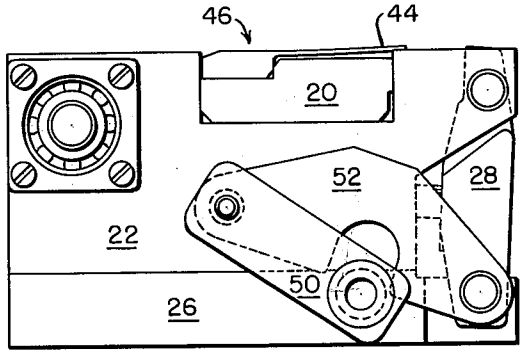


FIG. 4

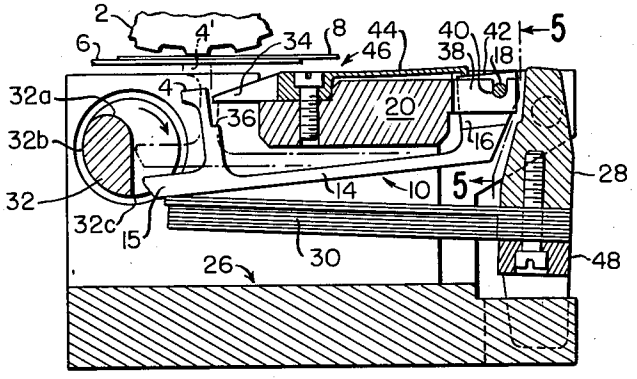


FIG. 5

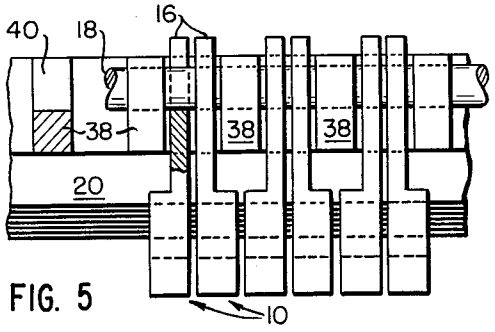
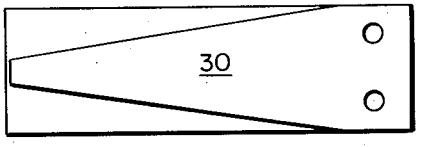


FIG. 6



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3,126,823
PRINT HAMMER ASSEMBLY

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Filed May 24, 1962, Ser. No. 197,399
6 Claims. (Cl. 101—93)

This invention relates to high speed printing machines, in particular to a print hammer assembly arranged for instantaneous printing as in machines where either the characters or the sheet to be printed are moving. The invention is herein described with reference to an embodiment designed for the repetitive printing of a line of information, as an account number on a quantity of bank checks, in which the sheet of checks moves continuously past a stationary line of characters, but it will be apparent that the principles and general concept are useful for other purposes.

The print hammer assembly of this invention is designed with reference to the problem of simultaneously and instantaneously striking several characters arranged in a line, to provide essentially uniform impressions of all characters, control of impact, and exceedingly sharp action. To these ends the invention features a plurality of hammers pivotally mounted side by side in a base member, springs for driving the hammers into contact with the characters while permitting them to be normally retained in a position displaced from the characters, and a rotating cam which displaces the hammers against the spring compression, and then releases them simultaneously as the sheet approaches the print position, causing them to be projected under the impulse of the springs into striking position.

For printing to take place rapidly and with uniform character impression, each character must be struck substantially simultaneously, with uniform impact and instantaneously. Accordingly, while all the hammers must act in unison, each is permitted to act independently of the others at the moment of impact so that uniform impressions are attained.

The invention thus further features a resilient stop for each hammer to control its striking impact and provide instantaneous rebound. Each hammer thereby operates independently of the other hammers at the moment of impact and automatically accommodates small tolerance differences in the characters, without being affected by the actions of adjacent hammers. Return of the hammers after impact is initially caused by rebound from the resilient stops and is additionally provided for by a biasing return spring which holds them at rest in contact with the main driving springs.

An additional feature of the preferred embodiment is the mounting of the main driving springs on a cradle which is adjustable to provide control over the impact force of the hammers.

The following detailed description of the presently preferred embodiment of this invention describes these and other features in greater detail and reference thereto is made for a better understanding. In the drawings:

FIG. 1 is a plan view from the printing side of the print hammer assembly of this invention;

FIG.2 is an elevational view taken from the right of FIG. 1;

FIG. 3 is a side elevation taken from the left side of FIG. 2;

FIG. 4 is a cross section taken at 4—4 in FIG. 1;

FIG. 5 is a fragmentary view, partly in section, taken at 5—5 in FIG. 4; and

FIG. 6 is a bottom plan view of the driving springs.

The print hammer assembly illustrated in the drawings is adapted for use with any of numerous printing machines in which characters 2 (FIG. 4) are arranged in a line of information opposite the faces 4 of the hammers. The paper 6 or other web on which the characters are to be printed, and a transfer sheet 8 carrying ink or other printing material are fed (by means not shown) between the characters 2 and the hammer faces 4. This invention is directed only to the print hammer assembly and is not concerned with the mechanism for retaining the characters 2 and controlling the feeding of the paper 4 and transfer sheet 6; numerous types of machines for these purposes are well known and a detailed description of them is unnecessary to an understanding of the print hammer assembly.

As noted above, the print hammer assembly is arranged to operate a line of hammers 10 having faces 4 arranged opposite and in striking relation to the characters 2. Operation of the hammers 10 is provided through a shaft 11 which is arranged to be driven in synchronism with the mechanism driving the paper 6 to provide for periodic actuation of the hammers at appropriate moments.

As illustrated best in FIG. 4, the hammers 10 include a head portion 12 which protrudes from a shank portion 14, terminating in a laterally extending base portion 16, and are assembled side by side on a shaft 18 to which the base portions 16 are pivoted.

The assembly of hammers are carried by a base 20 which supports them in printing position with the hammer faces 4 opposite the characters 2, and which in turn is carried between end plates 22 and 24 of a frame designated generally 26. A cradle 28 pivotally attached between the end plates 22 and 24 carries a number of driving springs 30 formed of parallel leaves extending laterally from the cradle into operable engagement with the hammers. The springs 30 are arranged to provide an impulse to the hammers 10 to drive them into impact with the paper 6 and characters 2.

The shaft 11 which operates the hammers 10 connects with a cam 32 rotatably mounted in bearings between the end plates 22 and 24, and operating against a follower 15 extending from the shanks 14 of hammers 10 beyond their heads 12. In cross section the cam presents a spiral lifting surface 32*a* extending from the center of rotation, merging into a riding surface 32*b* of fixed radial distance and terminating in an abrupt edge 32*c*. When the cam 32 is rotated in the direction indicated, the hammers 10 are pressed back against the springs 30 by the action of the lifting and riding surfaces of the cam and are simultaneously released as the edge 32*c* passes from the ends of the followers 15. At this instant all of the hammers 10 are driven toward the characters 2 by the action of the springs 30.

To this point in the printing operation, all the hammers have been controlled and activated in unison as required for simultaneous printing of the several characters. Following their actuation by the cam 32, the hammers 10 are permitted to act and operate substantially independently of each other so that each may properly print its corresponding character. For this purpose a resilient stop 34 extends outwardly from the base 20 into the path of each hammer 10, to control its striking motion and to cause it to rebound instantaneously. The head of each hammer is formed with a shoulder 36 which is located to contact the corresponding stop 34 as the hammer approaches striking relation with the characters 2. The arrangement of the stop 34 and shoulder 36 is such that they contact before the hammer strikes the character 2 so that impact with the character 2 occurs when the stop 34 is deflected by the force of the hammer 10. The impact of each hammer is accordingly limited by the deflection of the stop 34, each hammer deflecting its corresponding stop 34 by an amount required for impact with the character 2. As minor tolerance differences will exist

between the several characters, each hammer may accommodate this without being limited by the action of adjacent hammers. It is of course contemplated that all of the characters will be located within the limits of hammer motion accorded by the stops 34. As an example, the latter may permit a hammer motion of 0.005 inch, while the tolerance among the characters themselves would be, for instance, 0.002 inch with each lying well within the reach of motion of hammers.

In the preferred embodiment illustrated, the hammers 10 are removably retained as an assembly in the base 20, and for this purpose the latter is provided with a plurality of outwardly extending fingers 38 formed with aligned recesses 40 which define a groove in which the shaft 18 is received. The hammers are located in pairs between adjacent fingers 38, their base portions 16 being reduced in thickness alternately at right and left hand sides in order that the fingers 38 may be accommodated between them, as shown in FIG. 5. The base portions 16 terminate in flat aligned lands 42 which lie adjacent to the base 20, and contact a resilient blade 44 which serves the dual function of holding the assembly of hammers 10 in the base 20 with the shaft 18 seated within the recesses 40 and further holds the hammers in a retracted position against the drive springs 30.

The blade 44 and stops 34 are provided in the illustrated embodiment as integral parts of a striker plate 46 which is secured to the base 20. The striker plate, 46, including the stops 34 and blade 44, and also the hammers 10, are conveniently formed from tool steel, but other suitably resilient and durable materials may be used.

The impact of the hammers 10 may be varied by altering the position of the drive springs 30. These are secured to the cradle 28 at one end through a cap 48 and bolts and contact the cam follower portion 15 of each hammer in its retracted position. Each consists of ten spring steel leaves, two of which adjacent the hammers being rectangular, and the remaining eight being tapered to provide a distributed deflection, and actuates several hammers, as shown 8 in number.

Adjustment of the spring tension is provided by a crank 50 and drag link 52 arrangement connecting between the left hand end plate 22 and the cradle 28. As illustrated the cradle 28 is pivotally mounted between the end plates 22 and 24 on an axis close to the shaft 18, and the drag link 52 connects at a lower point and forms an acute angle with the crank 50. By rotating the crank 50, the drag link 52 causes the cradle 28 to rotate, thereby varying the pressure of the springs 30 against the hammers 10.

In the embodiment illustrated adjusting the tension of the springs is provided for by crank handle 54. A collar 56 carrying a shaft 58 coaxial with the main bearing of the crank 50 is provided in the frame 57 of the machine. The shaft terminates in a pin 60 and carries an arm 61 which terminates in a yoke 62. The crank 50 is formed with a hole 63 opposite its main bearing which receives the pin 60 and a lug 64 at its other end engages the yoke 62.

Rotation of the shaft is controlled by the handle 54 which engages its outer end, and includes a set screw 66 which urges a cylinder 68 carried within the handle against the outside of the collar 56 to lock the crank in its properly adjusted position.

From the foregoing description it will be seen that the hammers 10 are operated simultaneously to print a line of information upon rotation of the drive shaft 11, and that this need only be driven in synchronism with the mechanism (not shown) driving the web 8. The only other operational feature is the adjustment of the drive springs 30 to provide the proper hammer impact. This requires only that the handle 54 be positioned, counter clockwise for increased and clockwise for decreased impact, and secured by tightening the set screw 66.

Although this invention has been described in detail with reference to the presently preferred embodiment, it is contemplated that modifications will readily occur to those skilled in the art and familiar with the principles here set forth. Such modifications may be made without departing from the scope of this invention.

Having thus disclosed my invention, I claim and desire to secure by Letters Patent:

1. A print hammer assembly adopted for the instantaneous impression of a character on a moving web comprising a base member; a hammer having a shank portion and a generally transverse head portion which terminates in a striking face opposite said character and pivot means mounting the shank portion to said base; a resilient stop extending outwardly from said base member toward said head portion into intercepting relation with said hammer and being positioned to limit the motion of said head portion with respect to said character and to cause said hammer to rebound, a spring member extending from said base engaging said shank portion adjacent to said pivot means biasing said hammer away from said character, and means for driving said hammer by inertia against said character.

2. A print hammer assembly adapted for the instantaneous impression of a line of characters on a moving web comprising a base member; a plurality of hammers arranged side by side each having a shank portion and a generally transverse head portion which terminates in a striking face opposite a character and pivot means mounting said shank portion to said base; a plurality of resilient stops extending outwardly from said base member toward said head portions, each into intercepting relation with one of said hammers and being positioned to limit the motion of the head portion thereof with respect to said character and to cause said hammer to rebound; a resilient blade extending from said base engaging each of said hammers adjacent to said pivot means biasing said hammers away from said characters; and means for simultaneously driving said hammers against said characters.

3. The assembly defined by claim 2 wherein the base is positioned between the shank and the web and carries a plate on the side facing the web, said plate being formed with said stops at the side of the base adjacent the head portions and with said blade at the side adjacent to said pivot means.

4. A print hammer assembly comprising a base member, a plurality of parallel spaced fingers extending from said base member having aligned recess, a plurality of hammers each having a shank portion comprising a first end connected to a generally transverse head and a second end, said head terminating in a striking face, said hammers being pivotally mounted side by side on a shaft, said shaft being retained in said recesses with the second ends of the shank portions lying between said fingers, resilient means extending from said base member against said ends to hold said shaft seated within said recess and biasing said hammers from their striking position, and means for simultaneously driving said hammers.

5. A print hammer assembly comprising a base member, a plurality of parallel spaced fingers extending from said base member having aligned recesses, a plurality of hammers each having a shank portion comprising a first end connected to a generally transverse head and a second end, said head terminating in a striking face, said hammers being pivotally mounted side by side on a common shaft, said shaft for movement between striking positions and retracted positions being retained in said recesses with the second ends of the shank portions lying between said fingers, resilient means extending from said base member against said ends to hold said shaft seated within said recesses and biasing said hammers from their striking posi-

tions, drive springs contacting said hammers, and means for simultaneously moving said hammers from their striking positions to their retracted positions against said springs and simultaneously releasing said hammers whereby a line of characters is printed.

6. A print hammer assembly comprising a base member, a plurality of hammers mounted pivotally to said base member side by side for movement between retracted positions and striking positions for simultaneous striking of a line of characters in their striking positions, a cradle member pivotally mounted to said base member on an axis parallel to the axis of said hammers, spring means carried by said cradle member and contacting said hammers to urge them toward their striking positions, and means for controlling the pivoted position of said cradle

member whereby the force of said spring means against said hammers may be controlled.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,126,823 March 31, 1964

Wilfred Y. Benson

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 4, lines 51 and 59, for "recess", each occurrence, read -- recesses --; lines 69 and 70, strike out ", said shaft" and insert the same after "positions" in line 71, same column 4

Signed and sealed this 18th day of August 1964.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents