United States Patent

Avgerinos et al.

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[45] **Mar. 14, 1972**

[54] PARALLEL INPUT PRINTING MECHANISM

[72] Inventors: **Costas Avgerinos**, Wilton; **Henry R. Cofek**, Fairfield, both of Conn.

[73] Assignee: **Avgerinos, Inc.**, Norwalk, Conn.

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[21] Appl. No.: **32,272**

[52] **U.S. Cl.** ..... **101/93 C**

[51] **Int. Cl.** **B41j 9/26**

[58] **Field of Search** ..... 101/93 C, 94, 95, 93, 66, 287; 197/17

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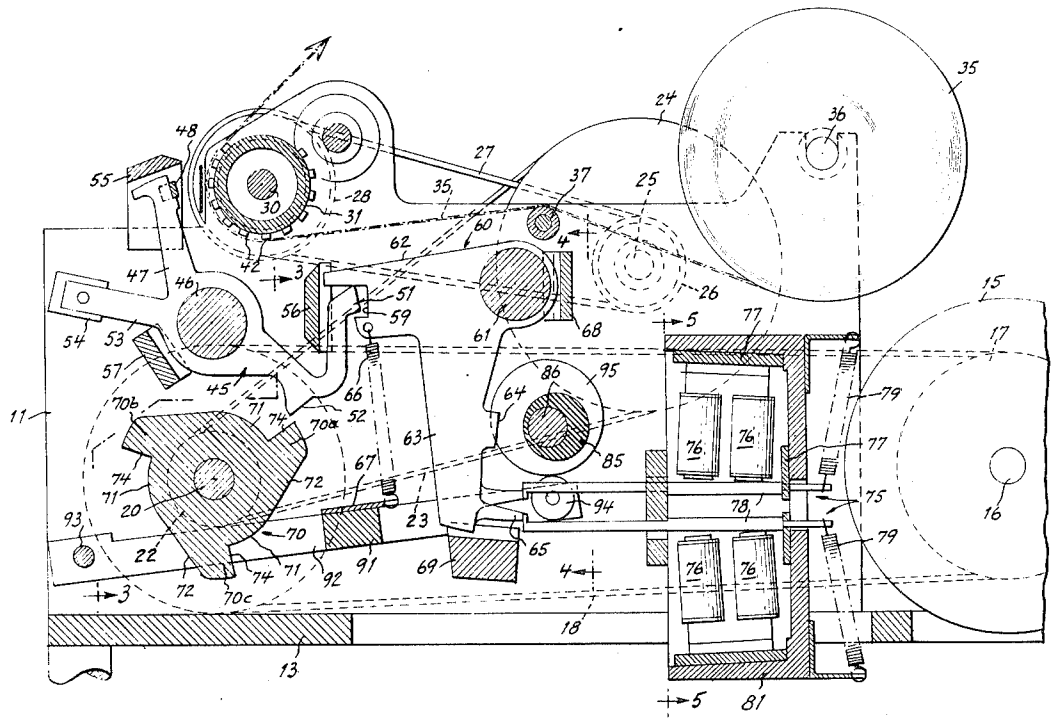
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Primary Examiner—William B. Penn
Assistant Examiner—E. M. Coven
Attorney—C. Garman Hubbard

[57] **ABSTRACT**

A simplified print action mechanism adapted for parallel input printers has a spring-biased power lever articulated with a print hammer for free throw firing of the hammer into printing impact with a rotating print drum carrying a type font. A restore cam, acting on the print hammer during its rebound following print impact, returns the parts to restored condition and also mechanically controls the firing time of the print hammer. Print impact energy is adjustable over a wide range, while the mechanism is operating, to suit various print transfer media through compound adjusting means by which the spring tension on the power lever and/or the extent of the power stroke of the power lever is readily altered.

19 Claims, 9 Drawing Figures



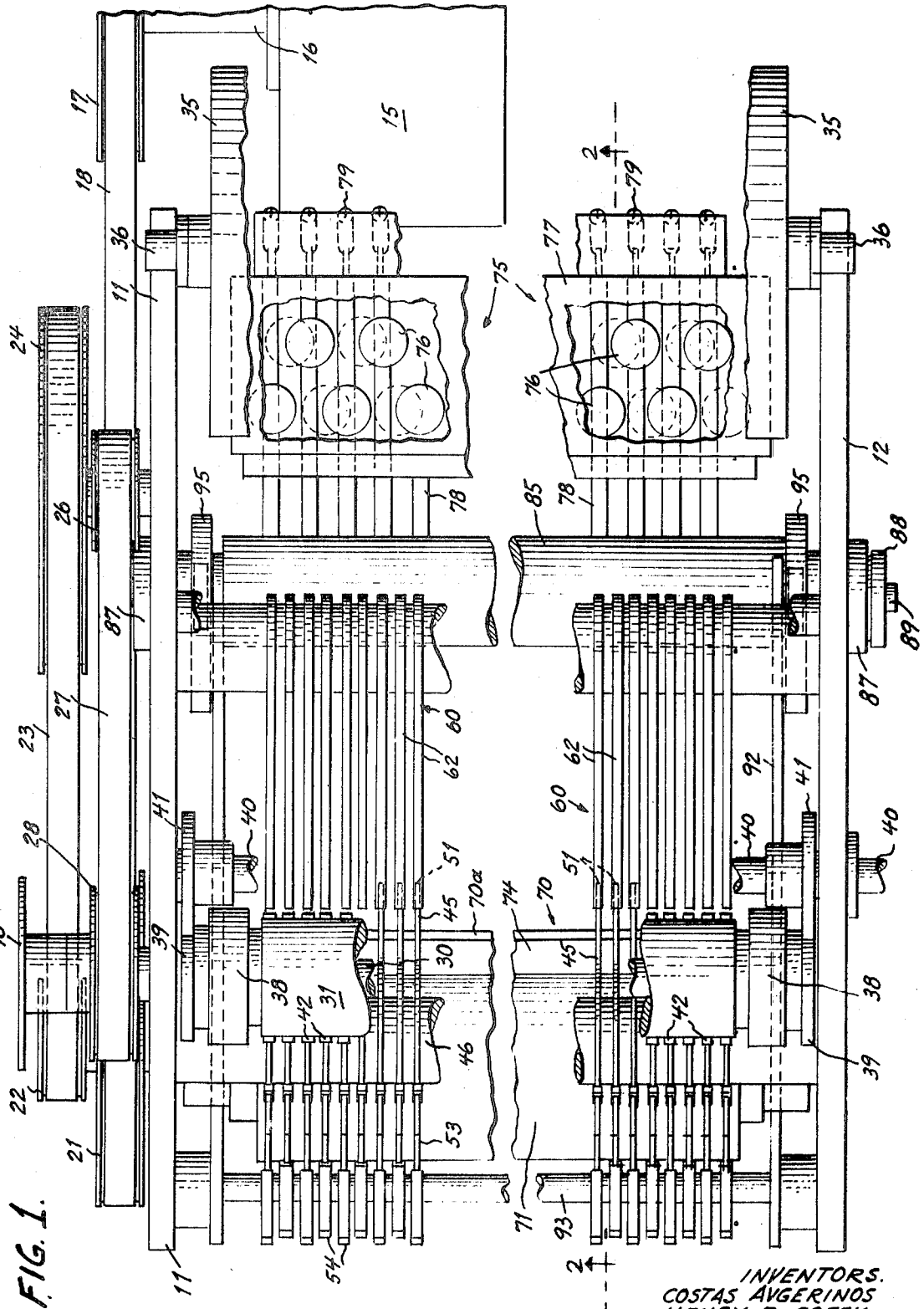


FIG. 1.

INVENTORS.
COSTAS AVGERINOS
HENRY R. COFEK
BY C. Harman Hubbard
ATTORNEY

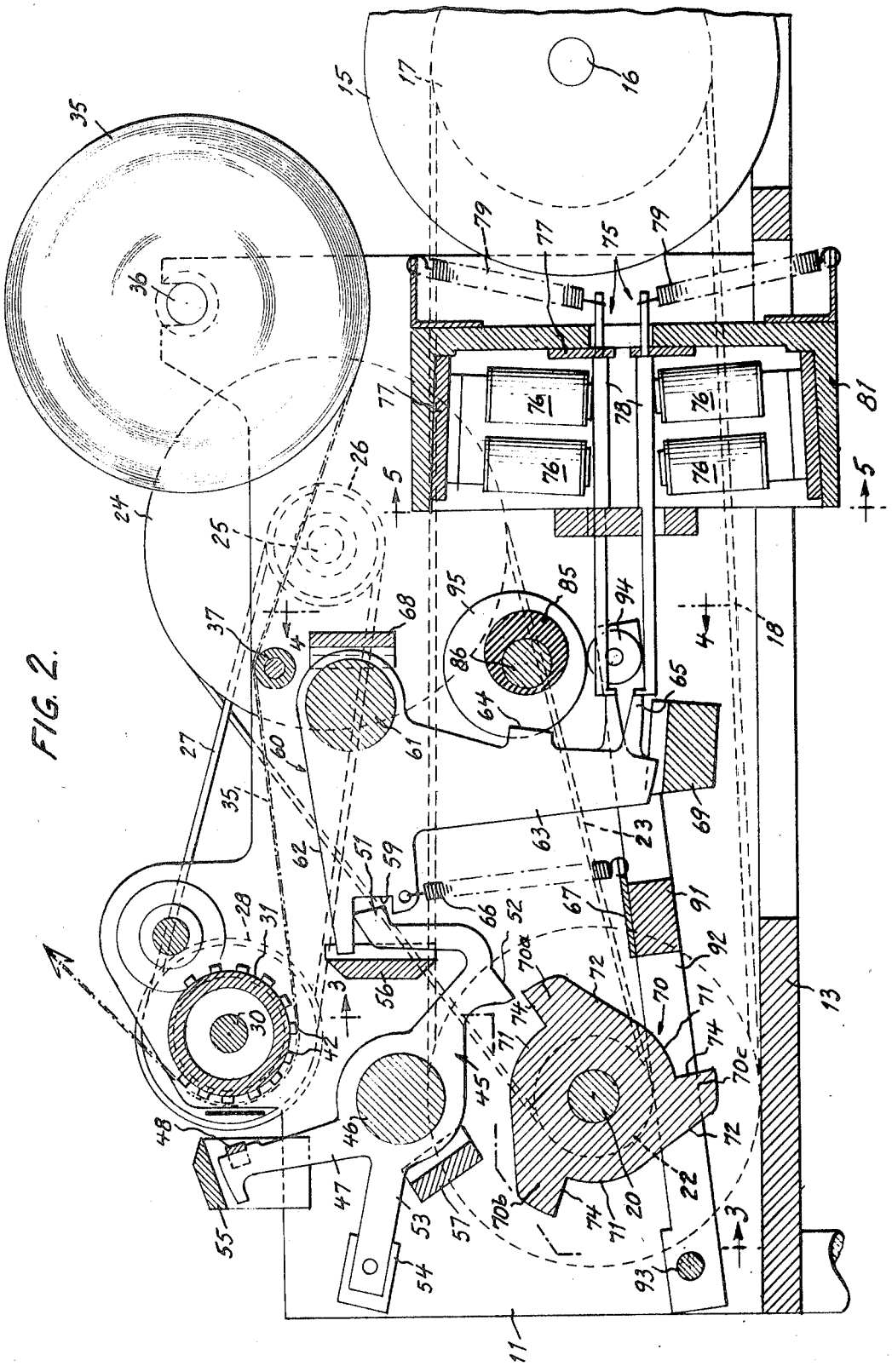


FIG. 2.

FIG. 3.

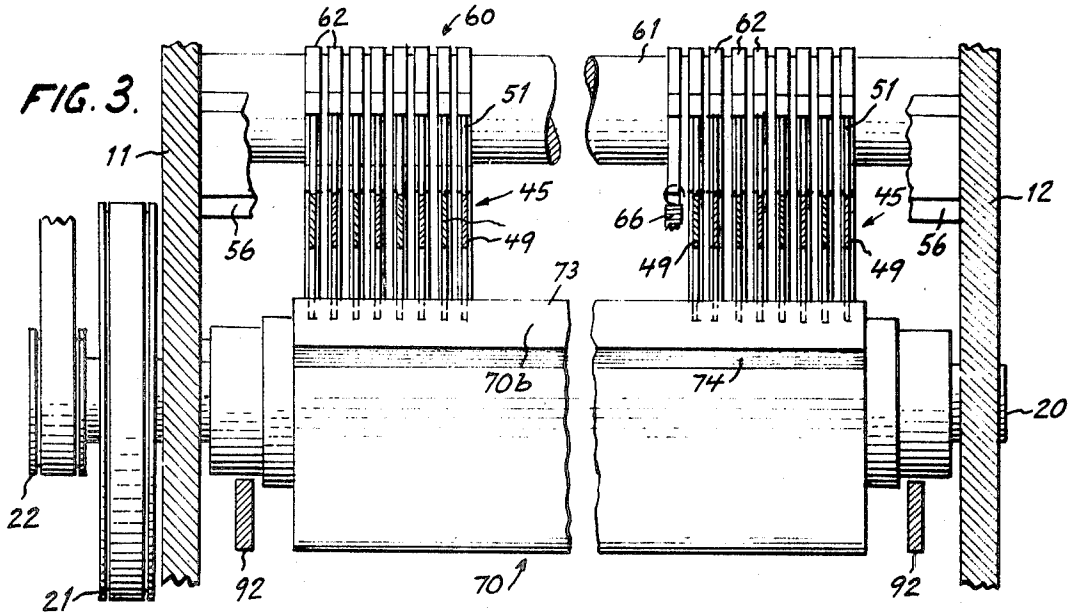


FIG. 4.

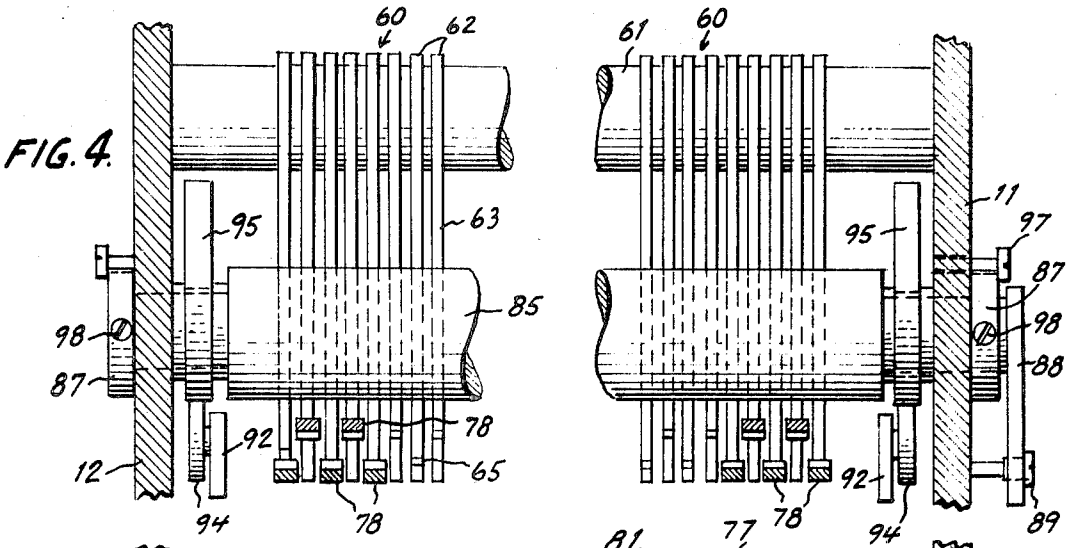


FIG. 5.

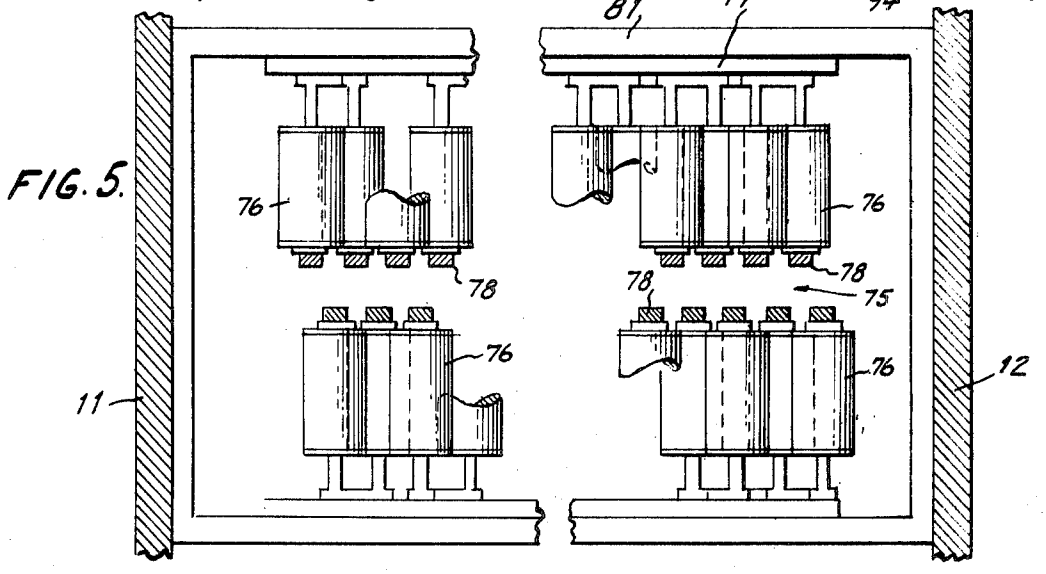


FIG. 6.

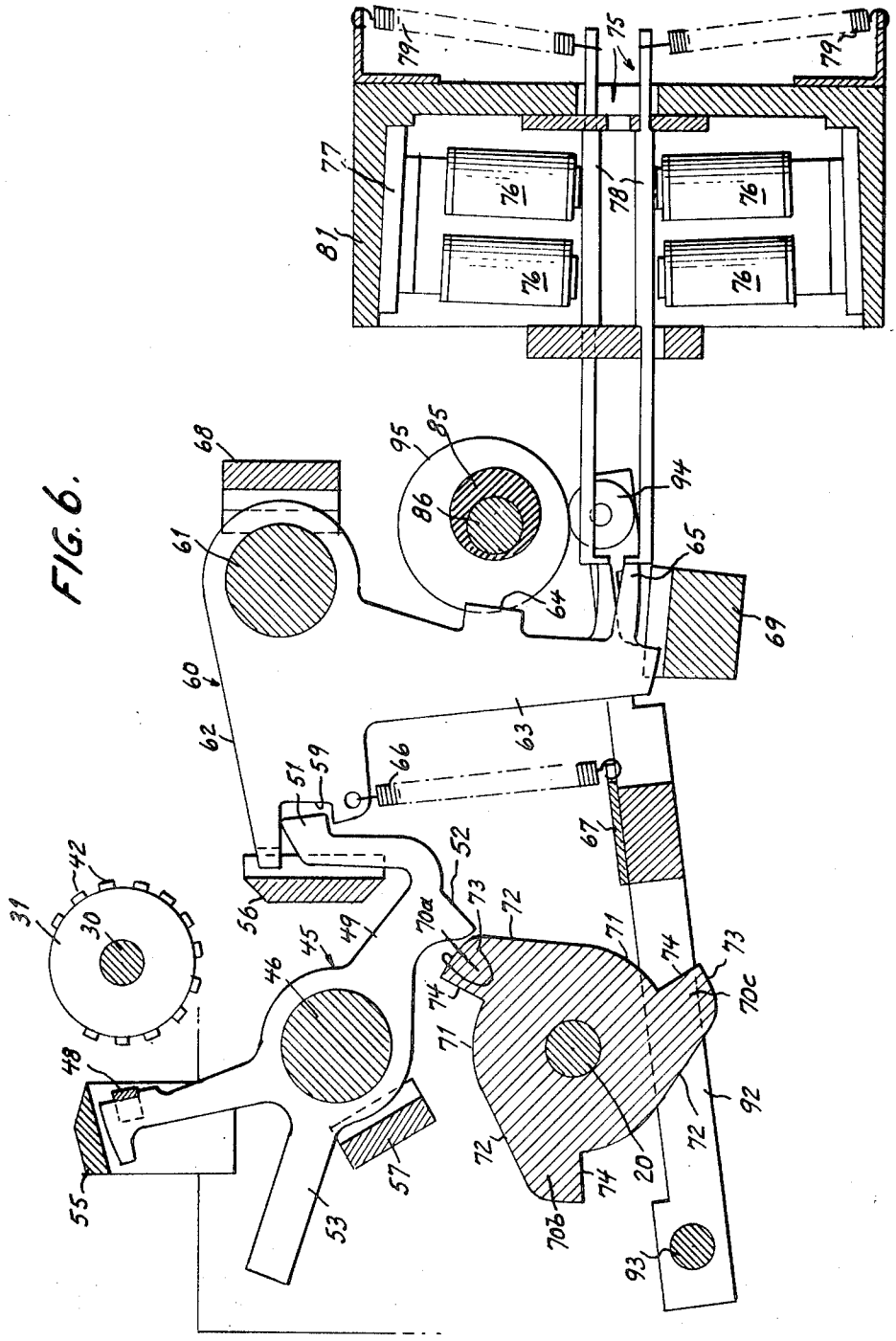

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FIG. 7.

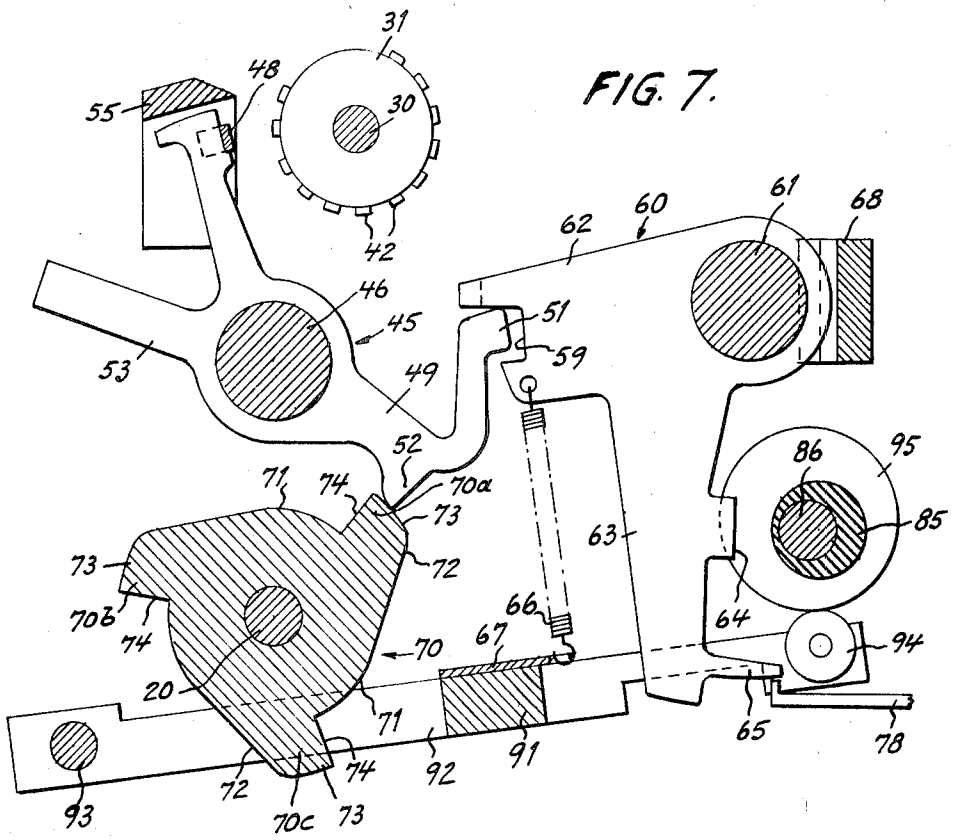
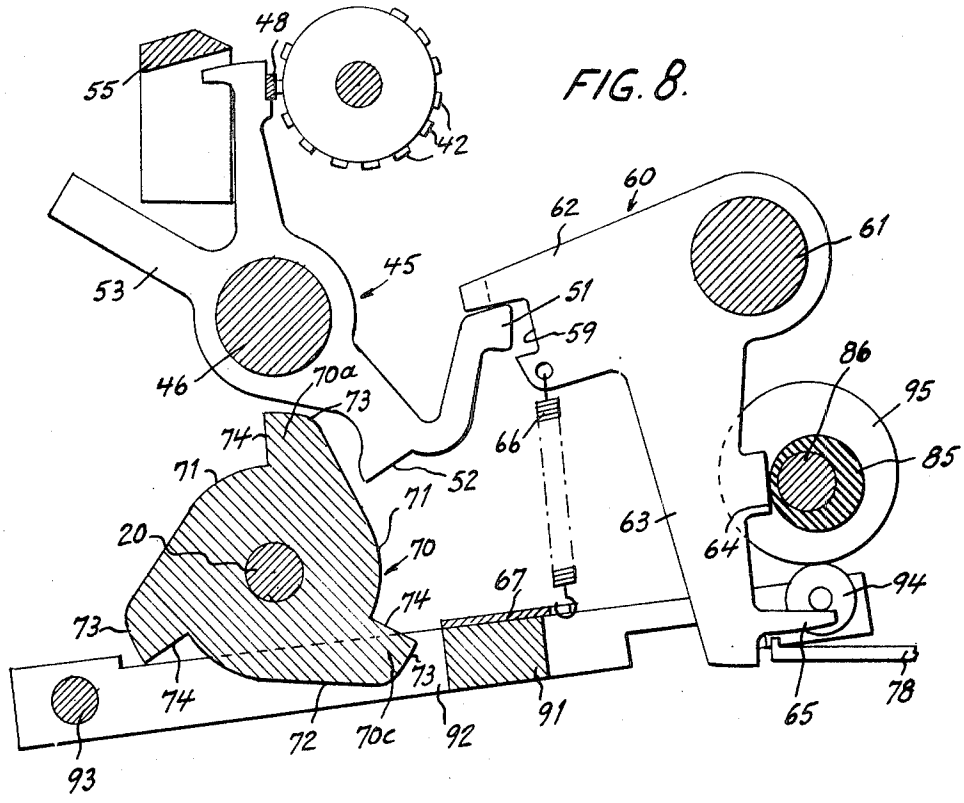

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FIG. 8.


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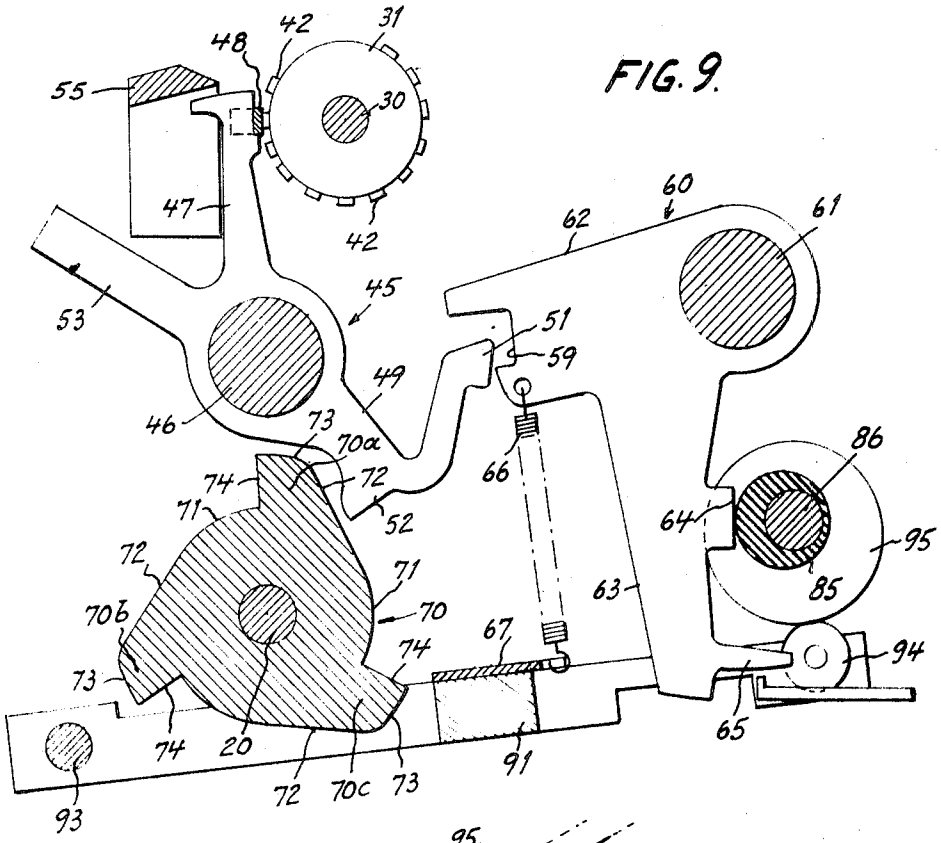

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FIG. 9.

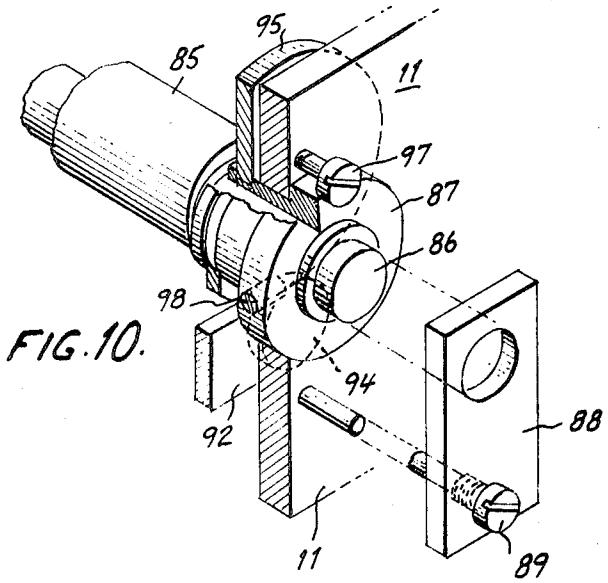

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FIG. 10.

PARALLEL INPUT PRINTING MECHANISM

BACKGROUND OF THE INVENTION

Printers designed for medium speed operation and intended to print out information generated in electronic computer systems have generally been of a highly complex design possessing a print action requiring many intricate parts and not readily adaptable or adjustable for achieving optimum print density with a variety of print transfer and receiving media. Also, said devices generally are electromechanically controlled through actuators energized for type character selection on a time sequence basis. The greater the number of parts in a print action mechanism, the more difficult is the adjustment thereof for proper operation and the greater opportunity there is for wear. Furthermore, where type character selection is dependent upon the precise time of actuator energization, the proper functioning of such actuators becomes highly critical, and a slight malfunction of an actuator whether it be from coil deterioration, sticking of its armature or slight irregularity in the power source, will result in a malfunction or unsatisfactory operation of the associated print action mechanism.

SUMMARY OF THE INVENTION

The print action mechanism according to the instant invention is designed to overcome the aforementioned problems by providing a mechanism comprised of a bare minimum of parts and operated with a mechanical control over the precise firing time initiated by the energization of an associated electromagnetic actuator. The mechanism includes a rotatable print hammer articulated with a spring biased power lever and coacting with a restore cam which mechanically times the release of the print hammer and then returns the print hammer along with the power lever to their restored positions. An actuator engaging with the power lever retains the parts in restored condition and when energized releases the power lever to initiate a print action operation. An operation of the mechanism includes a power stroke during which the energy in the spring biased power lever is transmitted to the print hammer as torque operating to rotatably drive the print hammer towards impact with the print drum. The power stroke is applied over a preselected arc, after which the print hammer may continue in free flight into printing impact. Immediately after printing impact, the restoring cam operates to return the print hammer and, through the print hammer, the power lever to their restored positions. The geometric relationship between the rotative axes of the printing hammer and the power lever and the design of the parts is such as to effectively couple the two parts when they are in their restored positions and to uncouple them when operated so as to permit free flight of the print hammer following the power stroke of the power lever. Adjustable means are provided for limiting the movement of the power lever so as to effectively alter the length of the power stroke. Adjustable means are also provided to vary the tension of the spring biasing the power lever. Either type of adjustment can be effected while the mechanism is in operation to thus facilitate the attainment of the desired adjustment. Furthermore, the former adjustment allows, if desired, for a power stroke continuing for the entire duration of the print hammer firing movement into printing impact, in which case there will be no free flight of the print hammer. By providing two modes of adjustment which affect the energy in the print hammer at the moment of impact, a wide range of adjustability in impact energy is present which renders the mechanism adaptable for use with many different forms of print transfer and print receiving media.

It is, therefore, an object of the invention to improve the reliability and flexibility of a print action mechanism adaptable for parallel input printers.

Another object of the invention is to improve upon the timing control for determining the firing time for an electromechanically operated print action mechanism.

A still further object of the invention is to provide a print action mechanism for a parallel input printer which is of a simplified design, economical to manufacture and having high efficiency and good durability.

Further objects of the invention, together with the features contributing thereto and the advantages accruing therefrom, will be apparent from the following description when read in conjunction with the drawing wherein:

FIG. 1 is a plan view, partly in section, of a parallel input printer embodying the print action of the instant invention.

FIG. 2 is a sectional view of the mechanism taken along the line 2—2 of FIG. 1 and illustrating a print action in its restored condition.

FIG. 3 is a sectional view taken along the line 3—3 of FIG. 2.

FIG. 4 is a sectional view taken along the line 4—4 of FIG. 2.

FIG. 5 is a sectional view taken along the line 5—5 of FIG. 2.

FIG. 6 is an operational view of the print action mechanism in side elevation at a time immediately preceding firing of the print hammer.

FIG. 7 is a view of the same mechanism after initiation of a firing action by energization of the associated actuator.

FIG. 8 is a view of the same mechanism at the moment of print impact.

FIG. 9 is another view of the parts at the moment of print impact but with the print density adjustments set to achieve a different print impact energy level.

FIG. 10 is a detailed view of the compound print density adjusting means.

Referring now to the drawing, the mechanism is mounted on a framework which includes an upright left-hand side frame 11, an upright right-hand side frame 12, both of which are suitably joined to a bottom frame 13 to constitute a framework having a substantially U-shaped configuration. Suitably mounted within the framework is an electric motor 15 connectable to a source of power and having a drive shaft 16 which carries a drive pulley 17. The pulley drives a belt 18 which runs to a pulley 21 mounted near the left-hand end of a restoring cam shaft 20, extending between and suitably journaled in the side frames 11, 12. Also mounted on shaft 20 is a driving pulley 22 of smaller diameter than pulley 21 and operatively connected through belt 23 with a pulley 24 mounted on a stub shaft 25 journaled in the left-hand frame 11. Additionally mounted on shaft 25 is a pulley 26 of smaller diameter than pulley 24 and operatively connected by a belt 27 with a pulley 28 mounted on a print drum shaft 30. The shaft 30 extends between and is suitably journaled in side frames 11, 12 and carries the print drum 31, hereinafter more fully described, which in operation is rotated clockwise by the motor through the driving means just described. For purposes of description, one complete revolution of the print drum will be considered one cycle of the machine's operation and, for reasons which will become more apparent hereinafter, the driving means just described effects speed reductions such as to rotate clockwise the restoring cam shaft 20 at a five to one ratio to the print drum shaft 30. The print drum shaft 30 is preferably rotated continuously, as shown, but if desired a one revolution clutch controlled to rotate the shaft in synchronism with shaft 20 could be employed.

The machine is adapted for use with a wide variety of print-receiving media, and any appropriate ink transfer media also may be employed. In the illustrated embodiment of the invention, the print-receiving media and ink transfer media are in the form of a web 35 of interleaved paper and carbon plies which runs around the front side of the print drum 31 and is supplied from a roll thereof carried by a spindle 36 supported in slots formed in the side frames 11, 12. The web is drawn over an idler roll 37 extending across the machine between the side frames and may be advanced for line spacing operations by any suitable means operable for feeding the web clockwise about the print drum so as to present it at the print station, which is at the front side of the print drum approximately midway between the top and bottom of the drum. For advancing

the paper and line spacing operations, gripper rolls **38** may be provided at each end of the print drum and rotatably mounted on the print drum shaft **30**. Said gripper rolls **38** each mates with an idler, not shown, to provide a web engaging nib and each is formed integral with a driven roll **39** disposed in engagement with a paper feed drive roll **41** carried by a paper feed drive shaft **40**. Shaft **40** is suitably journaled in the side frames **11, 12** and is operated by any suitable paper feed mechanism, not shown, controlled so as to step a shaft in a line spacing operation at an appropriate time of a machine's cycle. It, of course, will be understood that for use with certain forms of print receiving media provided with sprocket feed holes, sprockets may be substituted for the gripping rolls **38** illustrated herein. Also, it will be understood that in instances where single ply web of printing media is to be used, an inking ribbon together with any suitable means for supporting and feeding the ribbon may be provided, as is well known in the art.

The print drum **31** carries on its surface a font of type **42** in raised relief, which may in the illustrated embodiment include for each column or denominational order the 10 numerals, in addition to two punctuation or symbol type, providing a total of 12 different type for each printing column with each series of 12 type being arranged circumferentially around a major portion of the circumference of the print drum. Although there is shown herein a numeric print drum, it should be understood that the novel concepts herein employed are equally well adaptable for a print drum of greater capacity, e.g., 66 type, such as for an alphanumeric print drum. The print action mechanism, to be hereinafter described, would be essentially the same in either case. The number of columns or denominational orders is a matter of choice and can vary widely depending on the needs of the user.

The print action mechanism, of which there is one for each print column, includes a print hammer **45** rotatably mounted on a fixed support rod **46** supported by the side frames **11, 12** of the machine. The print hammer is in the shape preferably of a three-armed lever of which arm **47** carries a type-striking head insert **48** which is disposed to impact against a type element at the print station when the hammer is fired to imprint on the print-receiving media disposed therebetween. Arm **49** is formed with an undercut extremity **51** cooperating with power drive means and a cam follower projection **52** cooperating with restoring means, as will hereinafter be more fully described. The arm **53** of the print hammer is preferably provided to support a weighted slug **54**, suitably attached thereto, which may be used in instances where it is desired to alter the mass represented by the print hammer to effect a corresponding alteration in the impact force transmitted by the hammer when impacting against the print drum. Hammer guide combs **55, 56, 57** extending across the machine and suitably secured to the side frames maintain lateral alignment of the hammers of the respective columns relative to one another.

As will be noted, the extremity **51** of the hammer is accommodated in a cutaway opening **59** of a power lever **60** rotatably mounted on a support rod **61** extending across the machine and supported by the side frames **11, 12**. The opening **59** can be seen to be formed in the horizontal arm **62** of said power lever. The vertical arm **63** of said power lever is shaped to provide a limit surface **64** and at its lower extremity is formed with an abutment extension **65** cooperating with electromagnetic means through which the release of the power lever is controlled. A spring **66** stretched between the horizontal arm of the power lever and an anchor plate **67** places a counterclockwise bias on the power lever which is the driving force for rocking the print hammer into printing impact with the print drum. Guide comb bars **68, 69** secured to side frames **11, 12** maintain, along with comb bar **56**, lateral alignment of the several power levers.

Associated with the print hammers of the several columns is a restoring cam means in the form of a cam roll **70** carried by the restoring cam shaft **20**. Said cam roll extends substantially across the width of the machine and is formed with three identically shaped cam lobes **70*a–c***, respectively. Each cam lobe presents a profile which, starting with the low dwell surface **71** concentric with shaft **20**, includes a sharp rise surface **72**, a high dwell surface **73** concentric with shaft **20**, and a sharp instantaneous drop surface **74** merging into the next low dwell surface **71** of the roll. The respective cam surfaces are disposed for bearing engagement with the cam follower projection **52** of the print hammer to time the release of the print hammer and to restore the print hammer and power lever to their restored positions in the manner hereinafter more fully described.

Release of the print hammers to initiate a complete operation of a print action is achieved through electromagnetic means which include actuators **75** which are arranged in opposed upper and lower banks extending across the width of the machine and in staggered offset relation to one another in view of the narrow spacing existing between the print actions for adjacent columns. There is one actuator **75** for each print action and each comprises a pair of coils **76** mounted in a frame **77** which also supports a pivotal armature **78** biased by a spring **79**. The free end of each armature has a right-angle bend which is disposed in abutting relation to the abutment extension **65** of its associated power lever **60**. In this connection, it will be noted that the extension **65** of adjacent levers are slightly offset vertically from one another in order to better align with the armatures of their respective actuators. The actuators are effective for holding the associated power levers **60** and print hammers **45** in their restored position, as seen in FIGS. **2** and **6**, and when energized each unblocks the associated power lever permitting it to rock counterclockwise under the influence of its spring **66** which in turn imparts a driving clockwise torque to the associated print hammer **45**. The actuators **75** are mounted on frame bars **81** extending across the machine and secured to the side frames **11, 12**.

Adjustable means are provided for limiting the rocking movement of the power levers **60** to provide them with a power stroke of a preselected extent or duration. Said power stroke adjusting means includes a cam **85** in the form of a roll mounted eccentrically on a shaft **86** journaled in bearings **87** which in turn are rotatably mounted in the side frames **11, 12**. The periphery of roll **85** serves as a stop surface engageable by the limit surface **64** of the power levers when it is desired to limit the power stroke to an extent of movement less than a full power stroke. It will be noted that by rotatably adjusting the roll **85**, the power levers **60** of all print actions are limited to precisely the same stroke. The adjustment of the roll **85** is readily accomplished by means of a handle or arm **88** attached to the right-hand end of shaft **86**, see FIG. **10**, so as to be readily accessible to the user and enabling adjustment to be made while the machine is in operation. The adjustment may be maintained by a setscrew **89** threaded in the arm **88** and frictionally engaging side frame **12**.

Adjusting means are also provided for varying the tension of the power lever springs **66**. As will be seen, the anchor plate **67** is displaceable by being secured to a bar **91** supported at each end in arms **92**. Each arm **92** is pivotally mounted near the front of the machine on a pivot pin **93** secured to the machine framework and at its rear end carries a roller **94** disposed in engagement with a cam roller **95** mounted eccentrically on the housing for a bearing **87** which, as aforementioned, is rotatably mounted in a respective side frame **11, 12**. Rotative adjustment of the rollers **95** operates to stretch or contract all springs **66** uniformally so as to thereby adjust the bias on all power levers **60** in a uniform manner. Once the adjusted position is attained, the rollers **95** are locked in the adjusted position by means of a clamping screw **97** overlying the bearing housing and threadingly engaging a respective side frame **11, 12**. The arrangement and size of rollers **95** are such that in the adjustment of least force the springs **66** are only slightly stretched and, therefore, are close to their condition of initial tension.

The actuators are electrically connected to a signal emitter 96 which may be of a conventional type, but preferably photoelectric, and mounted on the left-hand end of the print drum shaft 30. The signal emitter serves as the interface with a data generating source, e.g., a computer, the output of which is fed to the signal emitter during a selected portion of a machine cycle and temporarily stored until distributed at precisely determined intervals of a machine cycle to initiate the operation of a print action at such time as will cause the associated print hammer to impact against the selected type of the print drum for transfer thereof to the print receiving media. In the present instance, a machine cycle may be considered to be divided into 15 even increments, 12 of which represent the time period for selecting one of the 12 type for printing, the other three intervals being the nonprint portion of the cycle during which incoming information is received and line spacing of the print-receiving web 35 occurs. In an embodiment employing an alphanumeric print drum, the machine cycle could be considered to be divided into many more intervals, e.g., 72, of which 64 might be used for type selection and the remaining eight intervals employed for data input and line feed of the print-receiving media.

A complete operation of a print action is initiated by energization of the actuator 75 for the column in which printing is desired. FIGS. 6 through 9 show successive stages in a typical operation of the print action. In FIG. 2, the parts are shown in the restored condition which could be prior to or subsequent to one operation of the particular print action mechanism therein shown. It will be noted in FIG. 2 that in the restored condition a small gap exists between surface 73 of the restoring roll 70 and the follower projection 52 of the print hammer. This gap is obtained from a slight amount of overthrow resulting from the restoring cam action. The overthrow is produced from inertia in the print hammer built up during the restoring action by virtue of the relatively steep profile of cam surface 72 and the relatively high speed at which the roll rotates which, as aforementioned, is a ratio of five to one with the print drum 31. The interval at which an operation of the print action mechanism is initiated is timed to occur when cam surface 73 of one of the three cam lobes of the restoring cam 70 is opposite the follower projection 52. At the specified ratio this is effected synchronously with the arrival of a type 42 at the print station. Upon energization of the associated actuator, the print hammer drops down into engagement with said surface closing the aforesaid gap and preventing any further rocking of the print hammer until surface 73 passes the follower projection 52. FIG. 6 illustrates the position of the parts immediately prior to the energization of the associated actuator. FIG. 7 shows the position of the parts immediately after the actuator has been energized and at a few degrees later in the same operation of the print action mechanism. In this manner, the cam lobe serves to mechanically determine the precise time in the cycle at which the print hammer is free to be rocked into printing impact with a selected type on the print drum. Thus, the precise firing or release time of the print hammer is not subject to various malfunctions or erratic performance of the associated electromagnetic actuator which otherwise could be responsible for print misregistration or other undesirable results. It should also be noted that in the illustrated operation of FIGS. 6–8, the power stroke adjustment is set to permit a full power stroke of the power lever 60, and the spring tension adjustment is set close to the condition of minimum spring tension. The energy in the power lever is transmitted from the point of contact between the extremity 51 of the print hammer and an overhanging surface in the horizontal arm 62 of the power lever. In a full power stroke adjustment, this contact is maintained throughout the entire throw of the print hammer with the result that the impact energy consists of the inertia within the mass comprised of the print hammer and the power lever. In other adjustments of the power stroke, the print hammer is given a free throw into printing impact so that the impact energy consists of inertia in the mass represented by the print hammer independently of the power lever. In the adjustment shown, FIG. 8 illustrates the parts at the moment of impact wherein the print head insert 48 strikes the selected type 42 which at that moment is being rotated through the print station. Low cam surface 71 allows just enough clearance for the complete hammer stroke. Immediately after impact and during the rebound of the print hammer, the restoring cam surface 72 picks up the follower projection 52 to start the return of the parts to their restored condition. As the restoring cam continues to rotate, the print hammer is positively returned at an accelerated rate such that as the cam surface 73 reaches the follower projection 52, the inertia in the restoring movement throws the print hammer off the cam surface for a limited amount of overthrow, at which time the armatures return to their blocking position and restrain the power lever and the print hammer in the restored position shown in FIGS. 2 and 6.

FIG. 9 illustrates the action under different adjustment conditions for the power stroke and the spring tension on the power lever. The adjustment shown in FIG. 9 is one wherein the power lever is limited to its shortest power stroke and the springs are at their maximum tension. Under these adjusted conditions, the print hammer, at the moment of printing impact, is free of the power lever thereby producing a considerably less dense print reproduction due to the lesser mass being impacted than if the power lever were not limited to a stroke less than a full stroke. The ability of the print hammer to become disengaged for free flight into printing impact under these adjusted conditions is made possible by the particular configuration of the print hammer extremity 51 and the recess 59 of the power lever in which it is accommodated. It will be noted that when in the restored condition, see FIG. 6, the point of contact between these parts is near and slightly above the center line extending between the respective rotational axes. Due to the configuration of the parts, the print hammer is in effect captured by the power lever when in the restored condition. After the power lever is released and passes through the dead center position, continued rotation tends to withdraw the parts from one another until the power lever reaches the end of its shortest stroke, by which time the separation of the parts has withdrawn them sufficiently to permit the print hammer to continue rotating in a free-throw arc into printing impact with the print drum. The length of the free-throw arc of the print hammer is thus adjusted by the setting of the cam roll 85. The shortest power stroke results in the longest free-throw stroke for the print hammer, and under conditions of the same spring tension the shorter the power stroke the less impact force will be imparted, since the torque applied to the print hammer by the power lever is applied at an accelerating rate and in an amount depending upon the spring tension adjustment. The design of these parts so as to enable the power lever in effect to encapture the print hammer when in restored condition eliminates the need for any detent, spring or the like, for retaining the print hammer in the restored position. Normally the relation between the spring tension adjustment and the power stroke adjustment would be one wherein the tension is increased as the length of the power stroke is decreased. However, there could conceivably be extreme conditions wherein this relation between the respective adjustments is preferably not maintained. By providing independent adjustment for the length of the power stroke and the degree of spring tension, a wide range of adjustability is possible in the amount of impact energy which the type hammer brings to bear when impacting against the type on the print drum. Of course, to simplify the adjusting means, such as to place the adjustment capabilities under the control of one machine-adjusting element, the shaft 86 could obviously be keyed, or otherwise rendered integral with the housing for bearings 87, such as by a setscrew 98 threaded in the bearing housing, so that merely by rotatively setting the bearings both the spring tension and the power stroke would be adjusted at one and the same time. If this manner of adjustment where to be adopted, preferably the cam roll 85 should be disposed relative to the rollers 95 so as to achieve the normal adjust-

ment relationship, above mentioned, which would increase the spring tension for shorter power strokes and, conversely, decrease the spring tension for longer power strokes.

From the foregoing it will appear that the mechanism described constitutes a highly simplified print action means which is capable of meeting a wide range of printing requirements and is reliable and efficient in operation. While there has been shown and described what is considered to be a preferred embodiment of the invention, it will, of course, be apparent that various changes in form could be made without departing from the spirit of the invention. It is, therefore, intended that the invention be not limited to the exact form herein shown and described nor to anything less than the whole of the invention as hereinafter claimed.

What is claimed is:

1. A print action mechanism for a parallel input printer having at least one font of type arranged circumferentially at predetermined spaced intervals on a print drum continuously rotated to sequentially advance the type in a succession of corresponding time intervals of a cycle into printing registration at a print station comprising;

a. hammer means including a lever formed with a driven arm rotatably mounted for executing a firing stroke by rocking about one rotational axis from a restored position into impact against a type at said print station;

b. spring-biased power means including a driving arm rotatably mounted for rocking about a different rotational axis parallel to said one axis and articulated in bearing contact with said driven arm to rock said hammer means when rotated in one rotational direction and to be rocked by said driven arm of said hammer means in the opposite rotational direction, said power means being retainable in a restored position and rockably releasable therefrom under its spring bias to apply torque on said driven arm for rocking said hammer means from its restored position through a firing stroke;

c. actuator means engaging said power means to retain same in its restored position and energizable to release said power means at a time of the cycle corresponding to the time a selected type arrives at said print station; and

d. restoring cam means shaped to provide at least one cam lobe disposed to bear on said hammer means following impact thereof with a selected type at said print station for positively returning said hammer means and concomitantly therewith said power means to their restored positions, said cam means being continuously rotated and synchronized with said drum to initiate and complete its restoring action on said hammer means and power means during the print cycle interval immediately before the next successive type arrives at said print station.

2. The invention according to claim 1 wherein said power means driving arm is rotatable from its said restored position through an arc constituting a power stroke, and said driven arm is disposed in abutting relation thereto maintaining contact therewith throughout said power stroke, and including;

a. means disposed to limit said power means at a degree of rotation which terminates said power stroke before the hammer means completes its firing stroke, said hammer means completing its firing stroke by its own inertia and separated from said power means.

3. The invention according to claim 2 wherein said limit means comprises a cam member rotatably settable to adjust the extent of the power stroke of said driving arm.

4. The invention according to claim 1 wherein the spring biasing said power means is stretched between said power means and an anchor member displaceable about a pivotal axis for adjusting the force of the spring bias on said power means.

5. The invention according to claim 2 wherein said limit means comprises a cam member rotatably settable to adjust the extent of the power stroke of said driving arm, and wherein the spring biasing said power means is stretched between said power means and an anchor member displaceable about a pivotal axis for adjusting the force of the spring bias on said power means and including;

a. a first adjusting member for rotatably setting said cam member; and

b. a second adjusting member for selectively displacing said anchor member.

6. The invention according to claim 5 wherein said first and second adjusting members are keyed together and are actuable unitarily to adjust the extent of said power stroke and the tension of said spring.

7. The invention according to claim 1 wherein said power means comprises a driving arm rotatable from its said restored position through an arc constituting a power stroke, said hammer means being unrestrainably rotatable and having its said driven arm disposed in abutting coplanar relation to said driving arm and maintaining bearing contact therewith throughout said power stroke and including;

a. means disposed to limit said power means at a degree of rotation which terminates said power stroke before the hammer means completes its firing stroke, said hammer means completing its firing stroke in unrestrained free flight and separated from said power means; and

b. said hammer means and said power means are counter-rotatable when released from their restored positions, said driven arm of the hammer means lever being formed with an undercut extremity and said driving arm of said power means being formed with a recess accommodating said extremity and shaped to restrain independent rocking of said driven arm when said arms are in their restored positions, said extremity and said recess lying near the center line between the respective rotational axes of said arms when in their restored position.

8. The invention according to claim 1 wherein the profile of said restoring cam lobe includes a steep rise surface engageable with a cam follower projection formed on said hammer means for returning said hammer means to its restored position, said steep rise surface extending from an initial low concentric surface to a high concentric surface and imparting overthrow momentum to said hammer means while returning same into restored position, the cam follower projection of said hammer means being spaced from said high concentric surface when in its restored position.

9. The invention according to claim 8 wherein said high concentric surface terminates in an instantaneous drop surface merging into said low concentric surface and is rotated into effective position for engagement by said follower projection at the start of a firing stroke, said high concentric surface limiting rotation of said projection to prevent said hammer means from completing its firing stroke until a predetermined time of a print cycle interval after said hammer means and said power means are initially released by said actuator means.

10. A print action mechanism for a parallel input printer having a font of type arranged circumferentially at predetermined spaced intervals on a print drum continuously rotated to sequentially advance the type in a succession of corresponding time intervals of a print cycle into printing registration at a print station comprising;

a. a print hammer in the form of a lever having an impact arm disposed adjacent said print station and a driven arm integral therewith, said lever being rotatably mounted for rocking about one rotational axis through a firing stroke during which said impact arm is driven from a restored position into impact against a type at said print station;

b. a spring-biased power lever rotatably mounted on a different rotational axis parallel to said one axis, said power lever having a power release arm and a driving arm articulated in bearing contact with the driven arm of said hammer lever to rock said driven arm when rotated in one rotational direction and to be rocked by said driven arm in the opposite rotational direction, said power lever being retainable in a restored position and rockably releasable therefrom for rocking in said one rotational direction under its spring bias through a power stroke

during which a torque is applied to said driven arm by said driving arm for rocking said print hammer from its restored position through a firing stroke;

c. actuator means having an armature engageable with said release arm for retaining said power lever in its restored position and energizable to release said power lever to initiate a power stroke;

d. a signal emitter synchronized with said print drum and operatively connected to said actuator means for controlling the energization thereof to release said power lever at a time of the cycle corresponding to the time a selected type arrives at said print station; and

e. a rotating restoring cam shaped to provide at least one cam lobe disposed to bear on said print hammer following impact thereof with a selected type at said print station for positively returning said hammer and concomitantly therewith said power lever to their restored positions, said restoring cam being continuously rotated in synchronism with said drum and timed to initiate and complete the restoration of said hammer lever and said power lever during the print cycle interval immediately before the next successive type arrives at said print station.

11. The invention according to claim 10 wherein said print hammer lever is unrestrainably rotatable and said driven arm is disposed in abutting coplanar relation to said driving arm to maintain said bearing contact therewith throughout said power stroke, and including;

a. a member disposed to engage the release arm of said power lever to limit its rotation in said one direction at a degree of rotation which terminates its said power stroke before said hammer lever completes its firing stroke, said hammer lever completing its firing stroke by its own inertia in unrestrained free flight and separated from said power lever.

12. The invention according to claim 11 wherein said member comprises a rotatable cam settable to adjust the extent of said power stroke.

13. The invention according to claim 10 wherein the spring biasing said power lever is stretched between said power lever and an anchor member pivotally mounted and rotatively displaceable about its pivotal axis for adjusting the force of the spring bias on said power lever.

14. The invention according to claim 13 including a cam member disposed for engagement by the release arm of said power lever to limit the extent of said power stroke, said member being rotatably settable to adjust the extent of said power stroke and including;

a. a first adjusting member for rotatably setting said cam member; and

b. a second adjusting member for selectively displacing said anchor member.

15. The invention according to claim 14 wherein said first and second adjusting members are keyed together and operate unitarily to adjust the extent of said power stroke and the tension of said spring.

16. The invention according to claim 10 wherein said hammer lever is mounted for unrestrained rotation and has its driven arm disposed in abutting coplanar relation to said driving arm to maintain bearing contact therewith throughout said power stroke, said hammer lever and said power lever being counterrotatable upon release from their restored positions, the driven arm of said hammer lever being formed with an undercut extremity and the driving arm of said power lever being formed with a recess accommodating said extremity and shaped to prevent independent rocking of said driven arm when said arms are in their restored positions, said extremity and said recess being disposed near the center line between the respective rotational axes of said arms when in their restored position, said extremity withdrawing from said recess while rotating away from said center line to enable independent rocking of said driven arm, and including;

a. a limit member disposed for engagement by said power lever at a degree of rotation which terminates said power stroke before the hammer lever completes its firing stroke, said hammer lever completing its firing stroke in unrestrained free flight by its own inertia and separated from the driving arm of said power lever.

17. The invention according to claim 10 wherein the camming surface of said restoring cam lobe has a profile which includes at its maximum radius a high concentric surface, and said driven arm is formed with a cam follower projection disposed for bearing engagement with said camming surface, the synchronous rotation of said restoring cam positioning said high concentric surface for engagement by said follower projection at the start of a firing stroke, said high concentric surface limiting rotation of said driven arm from its restored position to prevent completion of the firing stroke of said hammer lever until a predetermined time in the cycle.

18. The invention according to claim 17 wherein the profile of said cam lobe includes a steep rise surface preceding said high concentric surface and following an initial low concentric surface for returning said hammer lever to its restored position, said steep rise surface imparting overthrow momentum to said hammer lever in returning it into its restored position wherein it is spaced from said high concentric surface.

19. The invention according to claim 18 wherein said high concentric surface is followed by an instantaneous drop surface extending to said low concentric surface, said drop surface enabling unresisted rotation of said driven arm to complete the firing stroke of said hammer lever after said hammer lever and said power lever are initially released by said actuator means.

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