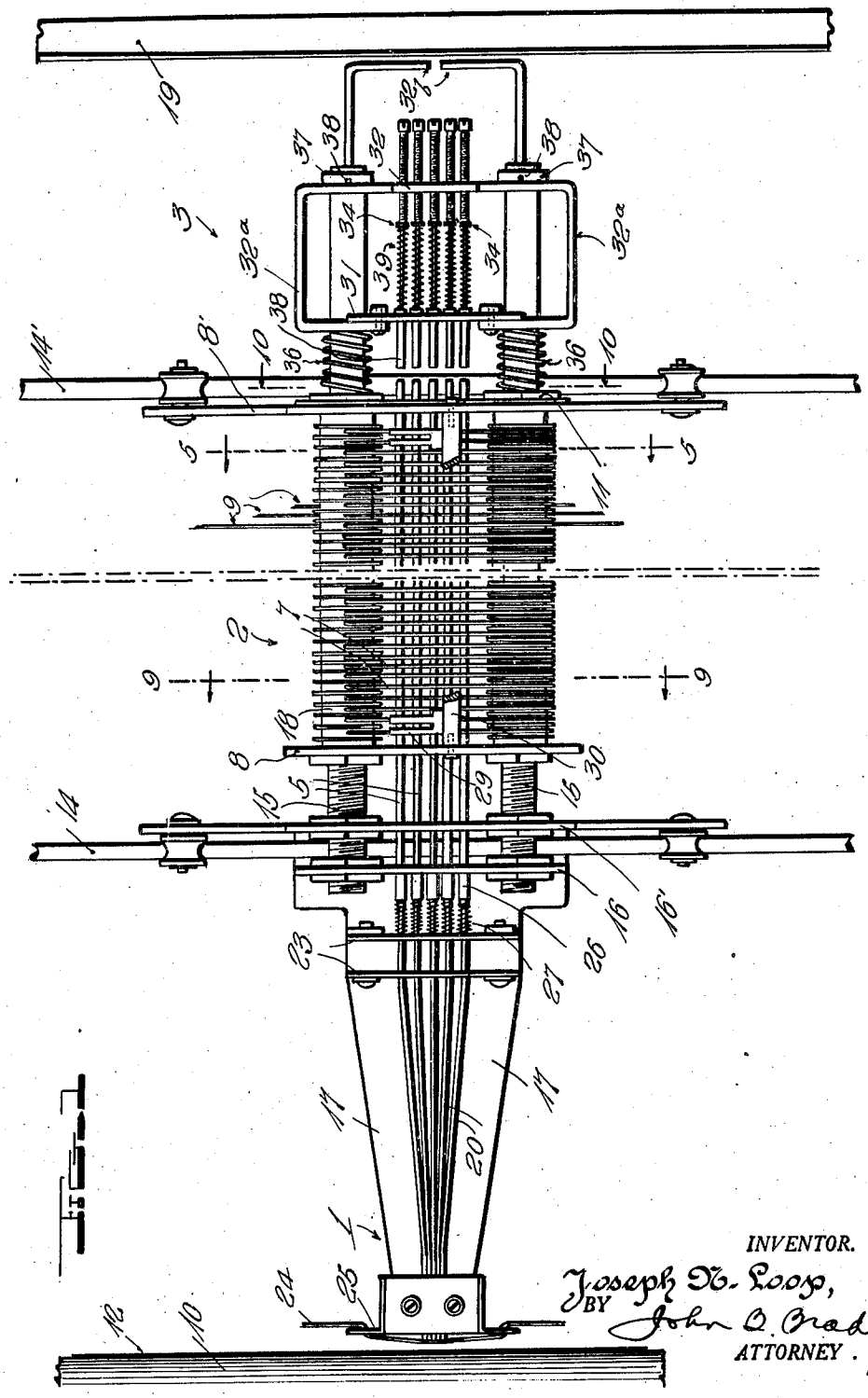
Sept. 6, 1938. J. N. LOOP 2,129,065

APPARATUS FOR PRINTING CHARACTERS

Filed July 6, 1937 3 Sheets-Sheet 1

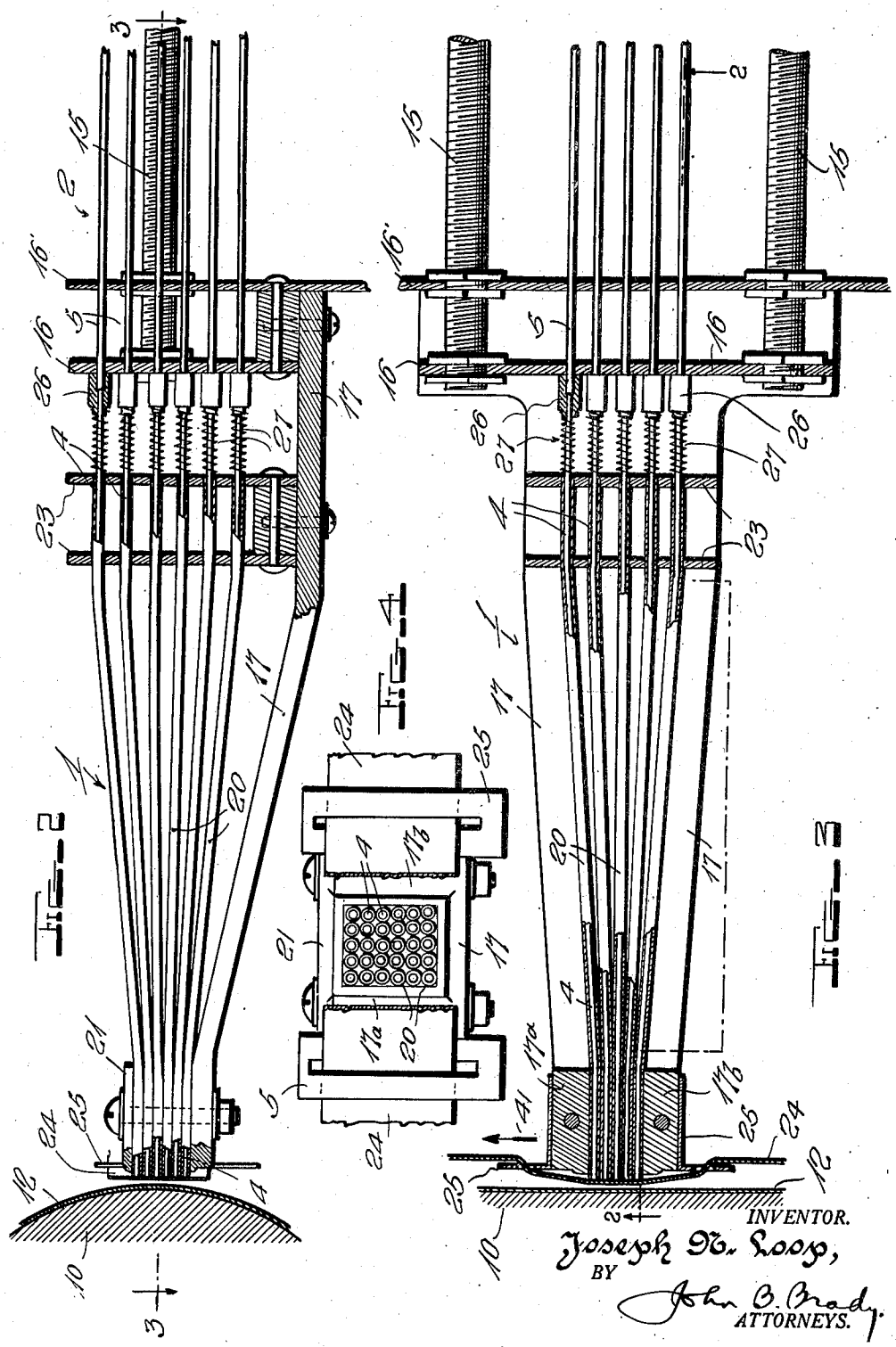


INVENTOR.
Joseph N. Loop,
BY John O. Brady
ATTORNEY.

Sept. 6, 1938. J. N. LOOP 2,129,065

APPARATUS FOR PRINTING CHARACTERS

Filed July 6, 1937 3 Sheets-Sheet 2



INVENTOR.
Joseph N. Loop,
BY
John B. Brady
ATTORNEYS.

Sept. 6, 1938. J. N. LOOP 2,129,065

APPARATUS FOR PRINTING CHARACTERS

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FIG. 5

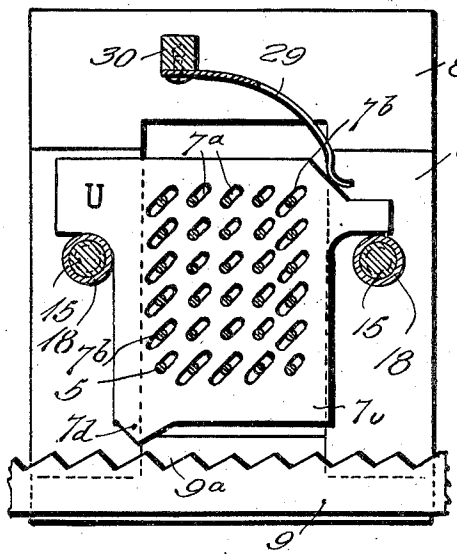


FIG. 6

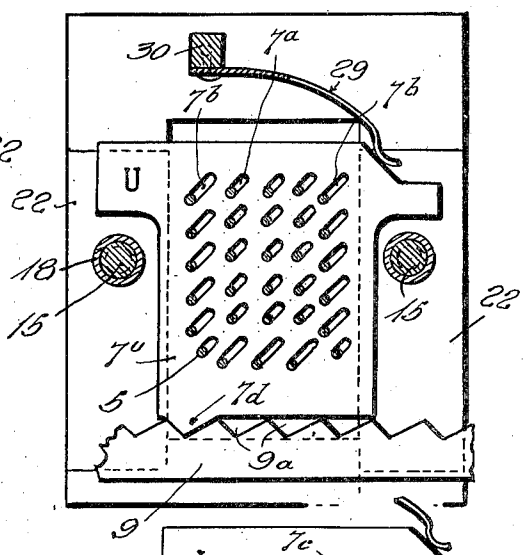


FIG. 7

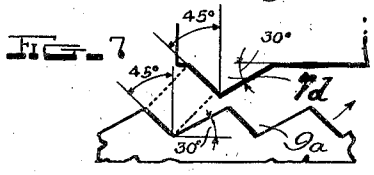


FIG. 9

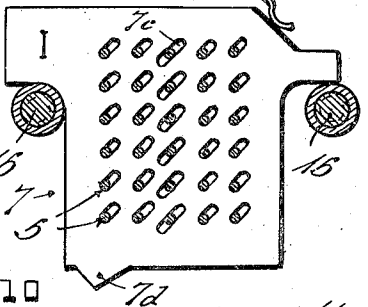


FIG. 8

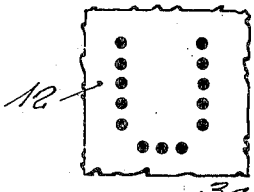
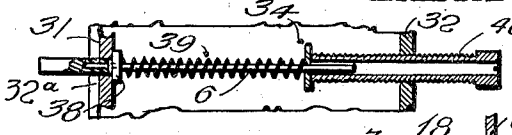


FIG. 10

FIG. 13



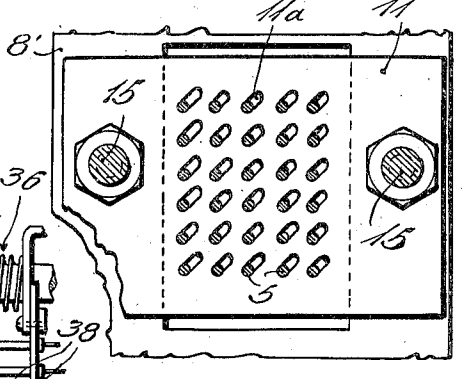
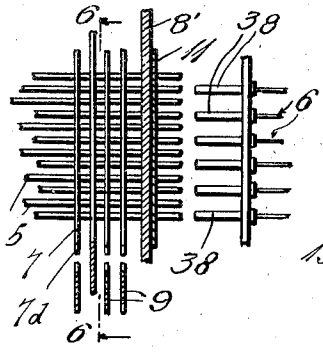


FIG. 11



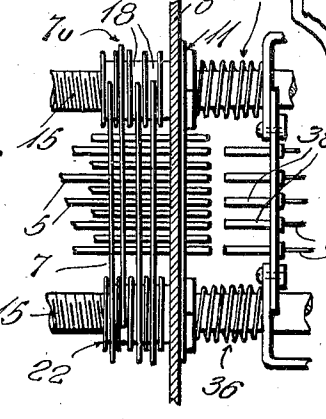


FIG. 12

INVENTOR.
BY Joseph N. Loop,
John B. Brady
ATTORNEY.

Patented Sept. 6, 1938 2,129,065

UNITED STATES PATENT OFFICE

2,129,065

APPARATUS FOR PRINTING CHARACTERS

Joseph N. Loop, Washington, D. C.

Application July 6, 1937, Serial No. 152,212

12 Claims. (Cl. 197—1)

My invention relates broadly to apparatus for typing and printing and more particularly to a construction of printing head and selective operating mechanism for marking or printing characters.

One of the objects of my invention is to provide a compact mechanism operative within short limits of movement for printing alphabetical and other characters at high speed.

Another object of my invention is to provide an inexpensive construction of printing apparatus for high speed operation wherein a multiplicity of marker members are selectively actuated in accordance with the character to be printed, other members being maintained inoperative.

A further object of my invention is to provide a multiple arrangement of marker members in rectangular formation, adapted to be actuated simultaneously, with a plurality of means individually selectively operable for determining the members to be actuated for printing a desired character.

Still another object of my invention is to provide a printing head movable with respect to the printing surface, and having a plurality of selector bars and a single actuating bar coacting therewith, all movable with limited displacement for high speed operation.

Still another object of my invention is to provide rigid supporting means for a printing head, and light and unrestricted anti-friction bearing contact for all movable elements so as to maintain high speed, trouble free operation in the printing head.

A still further object of my invention is to provide broadly a construction of typing and printing apparatus for high speed operation involving a minimum of parts adapted for automatic and coordinated operation at high speed.

Other and further objects of my invention reside in the structures and arrangements hereinafter more fully described with reference to the accompanying drawings, in which:

Figure 1 is a comprehensive top plan view partly in section, of the printing head of my invention; Fig. 2 is an enlarged vertical longitudinal view of the printing portion, with parts broken away and shown in section as on line 2—2 in Fig. 3; Fig. 3 is a horizontal sectional view taken substantially on line 3—3 in Fig. 2; Fig. 4 is a greatly enlarged face view of the printing terminus of the printing head of my invention; Fig. 5 is a vertical cross-sectional view taken arbitrarily on line 5—5 in Fig. 1; Fig. 6 is a view similar to Fig. 5 showing the actuated position of the apparatus as seen on line 6—6 in Fig. 11; Fig. 7 is a detail elevational view of the tooth and rack connection shown in Figs. 5 and 6; Fig. 8 is a detailed representation of the character printed with the apparatus in the position shown in Fig. 6; Fig. 9 is a vertical cross-sectional view similar to Fig. 5 taken arbitrarily on line 9—9 of Fig. 1; Fig. 10 is a vertical cross-sectional view taken substantially on line 10—10 in Fig. 1; Fig. 11 is a detail vertical longitudinal view of the apparatus, with an element of the assembly in actuated position as shown in Fig. 6; Fig. 12 is a detail plan view of the portion of the apparatus shown in Fig. 11, with the same element of the assembly in actuated position; and Fig. 13 is a detail longitudinal sectional view of one of the impact elements.

The apparatus of my invention is intended primarily for use in high speed telegraphic communication systems. Mechanisms heretofore employed in this respect, including type bar devices, bulky carriage structures and actuating means, have been limited to speeds below the capability of efficient operators whereas the apparatus of my invention will function at speeds up to one hundred and fifty words a minute, which is well beyond the more efficient typing speeds and even above record typing speeds. Insofar as the printing mechanism is concerned, the features which contribute to the high speed facility of my invention include a carriage structure of relatively small mass and the arrangement of character determining, marking or printing control plates operative in common with respect to a limited multiplicity of marker or printer members. Stationary mechanisms for selection and printing operations are arranged for coaction with the printing head in short quick movements effected with a minimum of lost motion. The construction of the printing mechanism of my invention is adaptable for manufacture at low cost on a quantity production basis in view of the relative simplicity of the mechanism with respect to prior art devices.

Referring to the drawings in more details, Fig. 1 shows in plan view the complete assembly of printer mechanism which can be divided for consideration, into three portions: the printer head 1; the selection or conditioning section 2; and the impact or actuating portion 3. Broadly, the arrangement includes a multiplicity of marker members or rods 4 in the printer head 1, a like multiplicity of intermediate push rods 5 in the conditioning section 2, and a like multiplicity of

striker pins 6 carried in the actuating portion 3. Normally the members 4, 5, 6 are respectively in alignment, but means are provided in the selection or conditioning section 2 for determining which of the marker rods are to be actuated. Such means, in the form of my invention disclosed, comprise a plurality of marking control plates 7 mounted on the push rods 5 between end plates 8 and 8', and actuating bar members 9 individual to the plates 7. A guide plate 11 is provided adjacent the end plate 8' to facilitate the operation of the control plates 7 on the rods 5.

The printer mechanism 1, 2, 3, is mounted with respect to a platen 10, carrying a paper sheet 12. The printing head 1 is rigidly mounted on rod members 15, as shown more clearly in Figs. 2 and 3, by means of the upright plates 16 and 16' which in turn support a frame member 17 constituting the base of the printing head 1. Plates 16' and 8' have downwardly flared extensions thereon carrying rollers engageable with the supporting rods 14, 14' for reciprocatory movement of the mechanism on the rods 14, 14'. The end plates 8 and 8' are fixed in spaced relation on the rod members 15 and the marking or printnig control plates 7 are supported thereon in the manner shown in Figs. 5 and 6, in separate spaced relation. The impact or actuating portion 3 is slidably mounted on the rod members 15 as indicated in Fig. 12, and adapted to be actuated by a striker arm 19 in the printing operation.

Referring particularly to Figs. 2–4 the printer head 1 comprises a multiplicity of small tubular guides 20 clamped in a close rectangular formation adjacent the end of the frame member 17, between portions 17*a* and 17*b* thereof and the cap plate 21. At the other end of the base 17 are provided supporting plate members 23 receiving the tubular guides 20 in spaced relation. The marker rods 4 extend through the tubular guides 20 and terminate evenly at the openings of the guides adjacent the paper 12. An inked ribbon 24 is provided, in the form of my invention shown, between the ends of marker rods 4 and the paper so that pressure of the rods against platen 10 produces an inked mark on the paper 12 in the relative position of the marker rod actuated. Combinations of such dots form the characters printed, as illustrated in Fig. 8 for the letter "U", as will hereinafter be more fully considered. A ribbon guide and support mounted on the base 17 is provided at 25, and suitable ribbon feeding means are employed. The opposite ends of marker rods 4 extend beyond the tubular guides 20 and are provided with collars 26 sweated or otherwise fixed therein and individual coil springs 27 operative between a plate 23 and the collars 26 to maintain the marker rods 4 retracted. Rods 4 terminate a certain distance within the collars 26 and are met by the ends of push rods 5 which also are fixed in the collars after passing through apertures in the plates 16 and 16'. When actuated, push rods 5 thus directly transmit motion to marker rods 4, and springs 27 are immediately effective to restore the rods to normal position so that smooth action is assured.

The push rods 5 extend from the plates 16 and 16' through a broad opening in end plate 8, the control plates 7, an opening in end plate 8', and guide plate 11, and terminate evenly adjacent the ends of striker pins 6. In order to maintain the control plates 7 in separate spaced relation, spacer plates 22 are arranged alternately with spacer washers 18 on rods 15 and clamped between end plates 8 and 8'. The arms of control plates 7 rest on the spacer washers 18 and are guided within the limits of adjacent spacer plates 22 upon the individual displacement thereof, as shown more clearly in Figs. 5 and 6. The lower end of spacer plates 22 serve to guide the individual actuating bar members 9 into engagement with the respective control plates 7.

As shown in Fig. 10, the guide plate 11 is formed with diagonal slits 11*a* through which the rods 5 pass and along which they are adapted to be bent, as will be further described. The marking or printing control plates 7 differ individually, and two examples thereof are shown in Figs. 5 and 9. The plate shown in Fig. 5 is adapted to provide the letter "U" and is designated 7_U, and the plate in Fig. 9, the letter "I" and is designated 7_I. Referring to Figs. 5 and 6, the plate 7_U is provided with slots 7*a* and 7*b* of different extent. In Fig. 5 the plate is shown in normal position, maintained so under the action of an individual spring member 29 supported with others of the same form from a frame structure 30 attached to upwardly extending portions of end plates 8 and 8' carried on rod members 15, as shown in Figs. 1 and 5 especially. The slots 7*a*, it will be noted, are short and extend upwardly only at an angle from the rods 5, so that any movement of the plate upwardly will displace the rods 5 passing therethrough. On the other hand, slots 7*b* extend both upwardly and downwardly, at an angle from the rods 5, so that movement of the plate in the direction of the slots upwardly will not displace the rods 5. In the plate 7_U, it will be noted that these slots 7*b* are in the form of a U, and the rods thus undisplaced by movement of the plate 7_U, as in Fig. 6, are the rods actuated to print a "U" on the paper 12.

In this operation, only the downwardly extending portions of the slots 7*b* are involved; the upwardly extending portions of slots 7*b*, together with slots 7*a*, provide means whereby all the rods 5 may be displaced upwardly with respect to the plate 7_U by others of the character determining printing control plates 7 in order to print one or another of the characters besides "U". The control plate 7_I, for example, provides for displacement upwardly of certain of the rods 5 which is effected through the upwardly extending slots 7*a* and portions of 7*b* in plate 7_U. Correspondingly, plate 7_I is provided with upwardly extending slots 7*a* and slots 7*c* having upwardly extending portions to accommodate the upward displacement of certain of the rods 5 by the plate 7_U. For convenience in manufacture, upwardly extending slots 7*a* may be connected with the downwardly extending portions of aligned slots 7*b* and 7*c*, without altering the manner of operation of the plates. The nature and function of slots 11*a* in guide plate 11 can now be more clearly understood as essentially providing for the upward displacement of any and all of the rods 5 by the printing control plates 7, while maintaining substantial alignment of the push rods 5.

The plate 7_U has been described as being in displaced position in Fig. 6. Displacement is effected by diagonally upward movement of the corresponding bar member 9 which is accomplished at substantially a 45° angle by any suitable means, which may be a selector mechanism operated by a multiple impulse telegraphic code signal, a manual keyboard, or remote control electromagnetic mechanism. The printing mechanism is reciprocatory on rods 14, 14' in steps corresponding to each printing space and with

an automatic return function. The bar members 9 extend crosswise of the machine in the direction of movement of the carriage, and are provided with angular recesses 9a corresponding to the steps of movement of the carriage. Each plate 7 has a projection 7d adapted to be engaged in the recesses 9a in its respective bar member. As illustrated in Fig. 7, the recesses 9a are formed with an obtuse angle, one side of which is inclined at substantially 45°, or normal to the direction of actuation of the bar member. This side is adapted to engage a similarly inclined edge of angular projection 7d to provide a normal abutting contact for shifting the plate 7. The adjacent sides of the recess and the projection are formed at an angle of 30° from the face of the member so as to avoid friction from rubbing contact between these sides while the actuating sides are moving into abutment, the corresponding sides being engaged at the same moment for efficient operation of the device.

Considering a plate 7 in displaced position, as in Fig. 6, the arrangement of the push bars 5 adjacent the ends of the striker pins 6 is shown particularly in Figs. 11 and 12, Fig. 11 being in elevation and Fig. 12 in plan, with parts broken and shown in section. The rods remaining in alignment with striker pins 6 are adapted to drive the corresponding marker rods 4 which hit the paper 12 through the inked ribbon 24, when the striker arm 19 is actuated. The impact or actuating portion 3 of the printer includes a frame structure comprising plates 31 and 32 connected by double bent portions 32a of plate 32. Also, plate 32 has rearwardly extending arms 32b for engagement by the striker arm 19. Plates 31 and 32 are slidably mounted on rod members 15, as shown in Fig. 1, by apertures in the portions 32a of plate 32. Coil springs 36 are carried between the end plate 8' and the impact portion by the rod members 15, and are effective to maintain the frame structure retracted, with plate 32 resting against retaining collars 37 secured by pins 38. In this position, striker pins 6 are slightly spaced from the adjacent push rods 5, allowing any of the rods 5 to be displaced. The striker arm 19 is arranged for operation in coordination with the actuating bar members 9 so that impact is transmitted to the marker rods 4 instantly upon the conditioning of push rods 5 by the selective operation of any one of the marking or printing control plates 7. A separate control plate is provided for each character which may be printed and the plates may be interchanged with a minimum of labor if it is desired at any time to provide different characters, or, where a code signal is employed to actuate selector apparatus, to provide a different response to a given code combination.

In Fig. 13, I have illustrated particularly by way of example the structure of one of the striker pins 6, which includes a collar member 38 sweated or otherwise fixed to the pin 6 and a coil spring 39 operative against the collar. The collar member 38 is loosely mounted in an aperture in plate 31 with the collar portion thereof limiting its outward movement. The other end of pin 6 is confined in the central bore of a sleeve member 40 which is mounted by screw threads in the plate 32. In operation, then, plates 31 and 32 are moved forward as one, and the striker pins 6 on abutting push rods 5 transmit motion therethrough to marker rods 4. At the limit of the stroke, pins 6 are forced into the bores of sleeve members 40 against the force of springs 39. The purpose of separate springs and individual striker pins with adjustable tension is to facilitate printing characters over uneven surfaces with equal clearness, and to enable adjustment for wearing characteristics in individual push rod and marker rod combinations.

The striker arm 19 returns quickly after moving forward a distance sufficient to give a good printing impression, allowing striker pin assembly 3 and operated push rods 5 to return to normal unoperated positions. Immediately thereafter on printing functions, the printing head assembly is moved to the right one space, in the direction indicated by the arrow 41 in Fig. 3, ready to print the next character. This brings the projections under the plates 7 in positions to be engaged by the next notches 9a in the actuating bar members 9. When the end of a line of printing has been reached, a carriage return function returns the printing head to the beginning of the line and platen 10 with paper 12 is turned by a line feed function. The characters may be printed by an inked typewriter ribbon, as shown, but the structure may be modified so that tubes 20 and marker rods 4 may be utilized for liquid inking or any other suitable marking means may be employed. Springs 27 also operate to return push bars 5 to unoperated position, limited by collars 26 as well as to withdraw marker rods 4 from printing contact.

Plates 16, 16', have holes which fit snugly about push rods 5 and are aligned in such a manner that when a printing control plate 7 is released by a bar 9, the push bars 5, which are made of spring material, immediately go back into line with striker pins 6, guided by the slots in guide plate 11, under their own spring tension. In other words, when printing control plates 7 are operated certain push bars 5 are bent out of the way of striker pins 6. The holes for push bars 5 in plates 16, 16' are aligned so as to reduce bind in the push bars which are operated to a minimum so that their endwise movement will be unrestricted. As to push bars 5 which are bent aside, a bind might be found in their passage through the holes in plates 16, 16', but as push bars are bent out of line to prevent their endwise movement, a bind in such instances is not detrimental but helps to prevent any motion of unoperated push bars.

Thus, while I have described my invention in a certain preferred form, I desire it to be understood that modifications may be made therein, and that no limitations upon my invention are intended except as may be imposed within the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent of the United States, is as follows:

1. Printing mechanism including a multiplicity of printing elements, striker means cooperative therewith for moving said printing elements to marking position, and separately actuated printing control means cooperative with the said printing elements for determining the number and arrangement of the printing elements actuated by said striker means.

2. Printing mechanism comprising in combination, a multiplicity of printing elements, actuating means therefor, and separately constituted means operative with respect to said printing elements for preventing operation of certain of said elements while permitting actuation by said actuating means of others of said elements in a predetermined formation.

3. Printing mechanism comprising in combina-

tion, a multiplicity of printing elements, a plurality of character determining means operative with respect to said printing elements and actuating means individual to said means, and striker means for printing through certain of said elements as determined by a selected one of said character determining means.

4. Printing mechanism comprising a frame structure, a multiplicity of tubular guide members mounted evenly in compact rectangular arrangement at one end of said frame structure, means for supporting the other ends of said tubular members in spaced relation, rod members extending through said tubular guide members, actuating means cooperative with said rod members, and means cooperative with the spaced rod members for preventing operation of certain of said members while permitting actuation of others in a predetermined formation.

5. Printing mechanism comprising a frame structure reciprocatory with respect to a printing surface, said structure being movable in spaced steps in printing relation to the printing surface, a grouped multiplicity of printing elements mounted on said frame structure, a plurality of character determining printing control plates carried by said frame structure and operative with respect to said printing elements, actuating means individual to said plates mounted apart from said frame structure and coextensive with the reciprocatory movement thereof, and actuating means for said printing elements including a striker arm mounted apart from said frame structure and coextensive with the reciprocatory movement thereof.

6. Printing mechanism including a printer head assembly comprising a base structure, a multiplicity of tubular guide members mounted evenly in compact rectangular arrangement at one end of said base structure, means for mounting the other ends of said tubular members in spaced relation, rod members extending through said tubular guide members and having portions thereof projecting at the spaced ends of said tubes; collar members fixed to said projecting portions of said rod members, individual spring means operative against said collar members mounted on said base structure, for maintaining the opposite ends of said rod members retracted within said tubular guide members and projectible against the action of said spring means.

7. Printing mechanism including a printer head assembly comprising a base structure, a multiplicity of tubular guide members mounted evenly in compact rectangular arrangement at one end of said base structure, marker rod members extending through said tubular guide members and projectible at the ends thereof, a ribbon support and guide carried by said base structure at the said end thereof, and an inked ribbon disposed in said support and guide and extending over the openings of said tubular guide members, said marker rod members being projectible to print through said inked ribbon on an adjacent printing surface.

8. Printing mechanism including a multiplicity of printing elements, actuating rod members individual to said printing elements, and means for selectively determining the rod members to be operated comprising a frame including parallel extending bar members, a plurality of plates supported on said bar members and apertured to pass said rod members; the apertures in said plates being in the form of upwardly extending diagonal slots, and said rod members being resilient so that movement of any one of said plates may effect displacement of the rod members with respect to the others of said plates, rendering such rod members inoperative, each of said plates having downwardly extending diagonal slots in a different predetermined formation permitting the rods passing therethrough to remain in normal position upon movement of the plate upwardly in the direction of said slots, said normally disposed rods being operable for actuating the corresponding printing elements.

9. Printing mechanism as set forth in claim 8 and including a guide plate fixed to said parallel extending bar members in back of said control plates, said guide plate being apertured by upwardly extending diagonal slots passing said rod members and permitting displacement of said rod members with respect thereto in the direction of said diagonal slots.

10. Printing mechanism including a multiplicity of printing elements, and means for actuating said printing elements comprising a striker pin assembly slidably mounted with respect to said printing elements, striker pins in said assembly individual to said printing elements, spring means individual to said striker pins, and individual means for adjusting the tension of said spring means.

11. Printing mechanism including a multiplicity of printing elements, a plurality of character determining printing control plates operative with respect to said printing elements, and actuating means individual to said plates comprising a notched actuating bar member and a projecting tooth on the respective plate cooperable therewith.

12. Printing mechanism as set forth in claim 11, with the actuating bar member adapted to move at an acute angle into engagement with the respective character determining plate, the meeting edges of said projecting tooth and the notch in said bar member being substantially normal to the direction of movement of the bar member, and the other edges of said projecting tooth and the notch in said bar member being disposed at an obtuse angle with respect to said meeting edges.

JOSEPH N. LOOP.