Feb. 12, 1963 M. RUDERFER 3,077,256

TYPEWRITING APPARATUS WITH CONSTANTLY ROTATING TYPE DISC

Filed June 10, 1960 2 Sheets-Sheet 1

FIG. 1

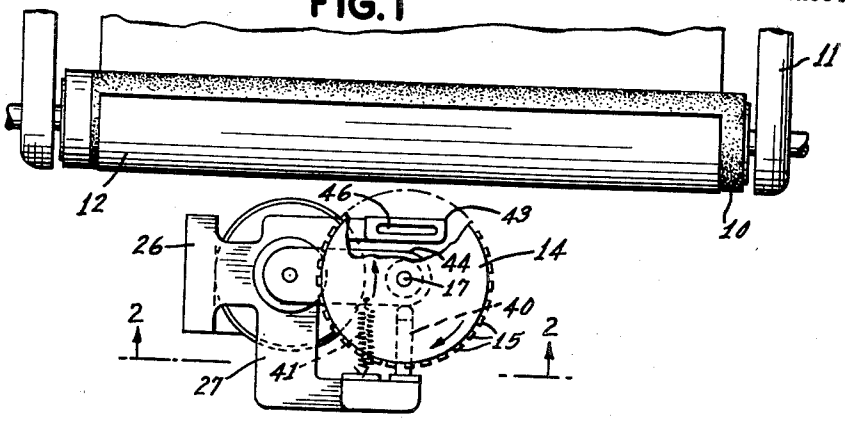
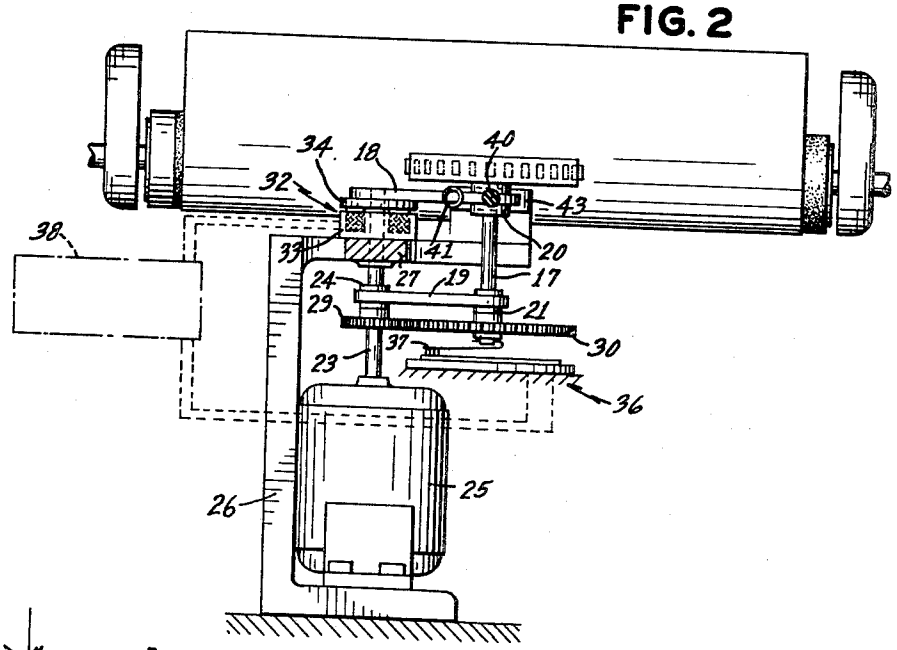


FIG. 2



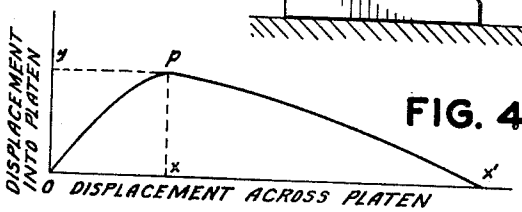


FIG. 4

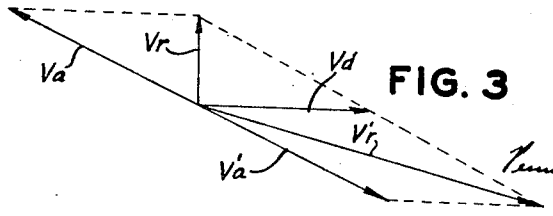


FIG. 3

INVENTOR.
MARTIN RUDERFER

BY

ATTORNEYS

Feb. 12, 1963 M. RUDERFER 3,077,256

TYPEWRITING APPARATUS WITH CONSTANTLY ROTATING TYPE DISC

Filed June 10, 1960

2 Sheets-Sheet 2

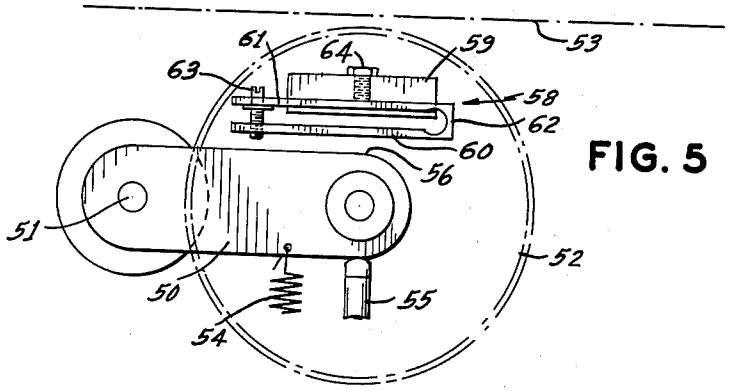


FIG. 5

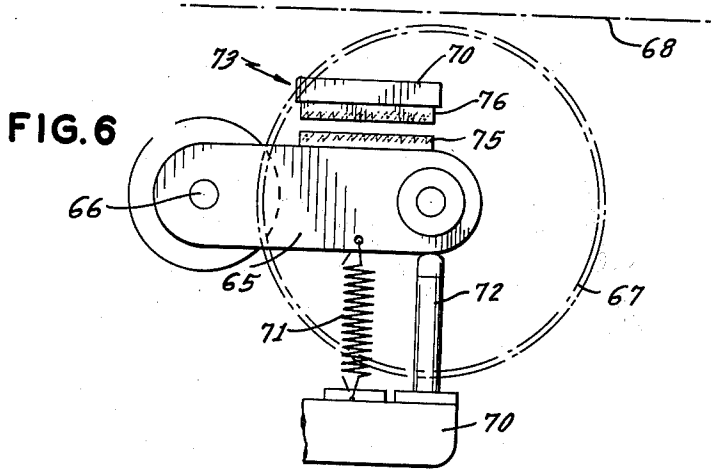


FIG. 6

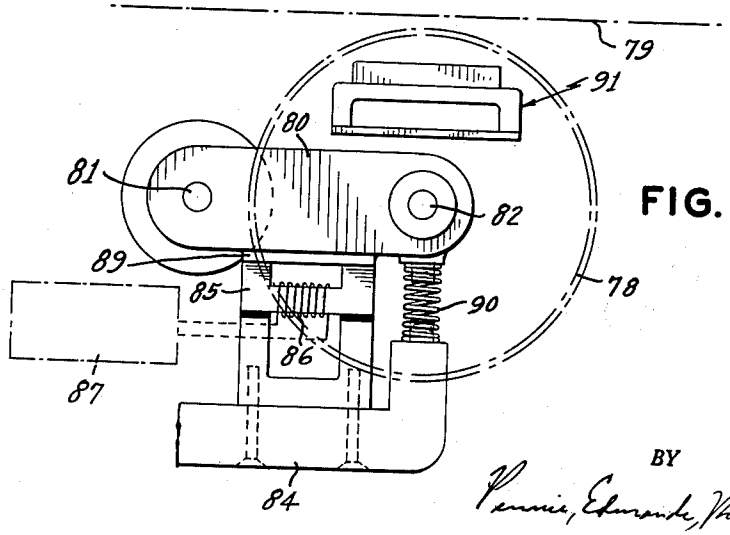


FIG. 7

INVENTOR.
MARTIN RUDERFER

BY

Pennie, Edmonds, Morton, Barrows & Taylor

ATTORNEYS

United States Patent Office 3,077,256 Patented Feb. 12, 1963

3,077,256

TYPEWRITING APPARATUS WITH CONSTANTLY ROTATING TYPE DISC

Martin Ruderfer, Brooklyn, N.Y., assignor to Dimensions, Incorporated

Filed June 10, 1960, Ser. No. 35,156
16 Claims. (Cl. 197—18)

This invention relates to typewriting apparatus wherein type faces are selectively brought into printing contact with a platen and, more particularly, to a novel method and apparatus for reducing the printing contact time between the type faces and the platen and also for reducing the impact energy absorbed by the platen. These improvements are especially advantageous in typewriting apparatus wherein the type faces are disposed about the periphery of a constantly rotating disc which is selectively displaced into engagement with the platen.

In a constantly rotating-disc typewriter, the quality of printing is largely determined by the time increment required for each type face to come into and out of contact with the platen, because the longer the type face and platen are in contact the more the rotary motion of the disc tends to blur the printed character. There are definite practical limits, however, in the extent to which this time increment can be reduced because as the type face is brought into contact with the platen more rapidly the impact energy absorbed by the platen increases. As a result of the small area of the type faces, the resultant impact stresses on the platen can exceed its yield strength, and damage the platen severely.

This invention has as its general purpose the provision of typewriting apparatus, particularly of the constantly rotating-disc type, in which the type faces strike the platen and rebound therefrom in appreciably less time than has been possible theretofore. This is achieved, however, by means which minimize the stress exerted on the platen. As a consequence of these improvements, substantially longer life is imparted to the typewriting apparatus and, perhaps more importantly, the quality of the printing is greatly enhanced.

Broadly stated, the invention relates to typewriting apparatus wherein type faces (which may be on a constantly rotating disc) are adapted to be brought into printing contact with a platen by selective relative displacement towards the platen of a member supporting the type faces. The improvement comprises a frame and stop means mounted thereon. The stop means are located with respect to one of the type face-supporting member and platen to reverse the motion thereof at substantially the same time the type face contacts the platen. The stop means are adapted to accomplish this reversal of motion in substantially less time than it would take for the type face to rebound from the platen alone.

In one embodiment of this apparatus, the stop means comprises magnet elements mounted on the type face-supporting member and frame respectively with surfaces of like polarity opposed to one another. Spring means are included for urging the member away from the platen. These magnet elements are adapted without colliding to reverse the motion of the arm at substantially the same time the type face contacts the platen.

In another general embodiment, which is perhaps even more important, the improvement resides in a frame and a stop element mounted thereon. This stop element is located with respect to one of the type face-supporting member and platen to collide therewith at substantially the same time the type face contacts the platen.

The invention further provides a method of making printing contact between a platen and type faces mounted on a supporting member. This method comprises momentarily displacing the member toward the platen in printing contact therewith. Substantial further displacement of the member is impeded by means other than the platen at substantially the same time the type face strikes the platen. Thereafter, the displacement of the member is reversed in substantially less time than it would take for the member to rebound from the platen alone. In one embodiment of this method, the member is a disc which is constantly rotated about its center. Momentarily, the disc is laterally displaced toward the platen along a curved path having a center remote from and substantially coplanar with the disc. The direction of angular motion of the disc along this curved path is opposite to the direction of rotation thereof about its center and the tangential velocity of the type faces relative to the center of the disc is less than the tangential velocity of the type faces relative to the center of the curved path.

Various particular embodiments of the broad inventive concept are described hereinbelow, but all are characterized in that they provide a method and means for rebounding the type face away from the platen at a substantially faster rate than the platen could alone. This is to say that the coefficient of restitution of the type faces (the ratio of outgoing to incoming velocity) is greatly increased by relying upon auxiliary means other than the platen to rebound the type face. These auxiliary means reduce the printing contact time and isolate the platen from a substantial portion of the impact energy, with the result that the printed characters are more distinct and the life of the platen is lengthened.

Preferred embodiments of the new apparatus are described hereinbelow with reference to the accompanying drawings, wherein

FIG. 1 is a fragmentary plan view of partly broken way typewriting apparatus embodying the invention;

FIG. 2 is a fragmentary section taken along the line 2—2 of FIG. 1;

FIG. 3 is a vector diagram illustrating the principle of operation of the new apparatus;

FIG. 4 is a displacement curve also illustrating the principle of operation;

FIG. 5 is a diagrammatic plan view of another embodiment of the apparatus;

FIG. 6 is a diagrammatic plan view of a further embodiment of the apparatus; and

FIG. 7 is a digrammatic plan view of yet another embodiment of the apparatus.

Referring now to FIGS. 1 and 2, the apparatus includes a rotatable platen **10** mounted on a carriage **11** which is adapted to index the platen **10** to printing position in any suitable manner. It is common practice in the art to surface the platen **10** with a layer of rubber to permit a certain amount of penetration of the type faces during printing. For convenience, reference is made in the specification hereinbelow and in the following claims to contact between the type faces and the platen. Actually, of course, the type faces generally contact a sheet of paper **12** overlying the platen or an inking ribobn overlying the paper. It is to be understood, therefore, that reference to contact between the type faces and the platen includes within its meaning contact between the type faces and the paper overlying the platen or the ribbon overlying the paper.

Mounted adjacent the platen **10** substantially coplanar with the center line thereof is a rotatable disc **14**. A plurality of type faces **15**, generally forty-two to forty-four in number, are disposed about the periphery of the disc **14**. Upper and lower cases of these type faces may be provided by including two rows about the periphery of the disc and incorporating the usual means for shifting to the desired row.

The disc **14** is affixed coaxially to a first shaft **17** which is supported by two arms **18** and **19**. The arms **18** and

19 are in rotatable engagement with the shaft 17 by means of bearings 20 and 21, respectively. Opposite the bearing 21, the arm 19 is rotatably mounted about a second shaft 23 by means of a bearing 24. The second shaft 23 is the drive shaft of an electric motor 25 mounted on a frame 26. At the end portion of the shaft 23 opposite the motor 25 is a journal bearing 27 also mounted on the frame 26. Rotation is imparted from the second shaft 23 to the first shaft 17 by a pinion 29 on the former which meshes with a larger gear 30 on the latter.

At the outer end of the second shaft 23 is an electromagnetic or electrostrictive clutch 32 or the like which includes a driving element 33 and a driven element 34. Normally, the clutch 32 is de-energized so that rotation is not imparted from the shaft 23 to the driven element 34. However, when the clutch is energized, the driven element 34 rotates with the driving element 33 and with the shaft 23. Affixed to the driven element 34 of the clutch 32 is the end of the disc-supporting arm 18 opposite the end thereof which is in rotatable engagement with the first shaft 17.

By this construction, the arm 18 is adapted to pivot about the shaft 23 whenever the clutch 32 is momentarily energized. This causes the disc 14 to be displaced momentarily in a counter-clockwise direction as shown in FIG. 1. One of the type faces 15 on the periphery of the disc is thereby brought into printing contact with the platen 10. Selective actuation of the clutch 32 in this manner may be accomplished in any suitable manner, for example by the circuitry described in my U.S. Patent No. 2,675,108. Thus, a commutator 36 may be in engagement with a brush 37 on the end of the first shaft 17 so that at the proper moment the clutch 32 is energized when the appropriate key is struck on a keyboard 38 (shown in dotted lines in FIG. 2).

Since the disc 14 is constantly rotating when brought into printing contact with the platen 10 as described, it is necessary to keep the printing contact time to a minimum in order to prevent blurring of the printed character. At the same time, the relatively inelastic rubber platen must not be damaged by the impact energy of the disc assembly. Thus, in accordance with the invention, the arm 18 which actuates the disc 14 during printing normally rests against an abutting element 40 attached to the frame. Also, a tension spring 41 interconnects the frame and the arm 18 to urge the arm against the abutting element 40. These members establish the normal position of the disc 14 relative to the platen 10. Spaced between the outer end of the arm 18 and the platen 10 is a stop element 43 against which the portion 44 (FIG. 1) of the arm 18 collides substantially at the same time the particular type face 15 engages the platen 10. The stop element 43 may be provided with a central cut-out portion 46 as shown in FIG. 1 to decrease its stiffness; in general the stop element 43 is considerably more elastic than the platen 10.

When the clutch 32 is energized momentarily, the arm 18 pivots in a counter-clockwise direction as seen in FIG. 1. At all times, of course, the disc 14 is rotating in a clockwise direction as shown in FIG. 1 because of the gear and pinion drive between the shafts 23 and 17. Also, the arm 18 is pivoted by the clutch 32 at a greater angular velocity than that of the disc 14 with respect to its shaft 17 because the pinion 29 is substantially smaller than the gear 30. Therefore, the particular type face 15 which engages the platen 10 has velocity components as shown in the vector diagram of FIG. 3.

The vector V_a represents the tangential velocity of the type face 15 relative to the pivot point of the arm 18 and is thus perpendicular to a line joining the center line of the shaft 23 with the point of contact of the type face on the platen. The vector V_d represents the tangential velocity of the type face relative to the center line of the shaft 17 and is thus parallel to the surface of the platen 10. These two components V_a and V_d are added to give a resultant vector V_r which is the actual incoming velocity of the type face relative to the platen 10. As is apparent from the vector diagram of FIG. 3, V_r can be perpendicular to the platen 10 if the magnitude and direction of V_a and V_d are properly chosen. A perpendicular approach of the type face relative to the platen 10 is most advantageous, of course, because the type face then does not wipe across the platen and thereby blur the printed character and the place of impact of the type face on the platen parallel to the center line of the platen is not affected by the number of sheets overlying the platen. The magnitude and direction of V_a and V_d may be varied to give the proper resultant velocity V_r by suitable selection of the gear 29 and pinion 30, the length of the arm 18, and the angle between the point of contact with platen and the line joining the center of shafts 17 and 23.

As soon as or just before the particular type face 15 engages the platen 10, the surface 44 on the arm 18 also collides with the stop element 43 as described. Because the stop element 43 is considerably more elastic than the platen 10, it is the stop element which principally impedes substantial further motion of the type face and shortly thereafter reverses the direction of motion of the arm 18. This is to say that the disc assembly strikes both the stop element 43 and the platen 10 but is rebounded only by the stop element. Because of the high elasticity of the stop element 43, the coefficient of restitution of the disc assembly (i.e. the ratio of outgoing to incoming velocity) is close to unity . Since the platen 10 is relatively inelastic, it returns to normal position more slowly and thus lags behind the type face during the rebound.

The velocity of the type face during the rebound is also shown in the vector diagram of FIG. 3. Under rebound conditions, the arm 18 is pivoting clockwise as shown in FIG. 1 so that the type face has a tangenital velocity relative to the point of the pivot of the arm 18 represented by the vector V'_a. The tangential velocity of the type face relative to the center line of the shaft 17 is, of course, still V_d during the rebound. The resultant velocity of V'_a and V_d is represented by the vector V'_r which is of considerably greater magnitude than the resultant incoming velocity V_r.

The effect these velocities have on the movement of the type face relative to the platen is illustrated by the curve shown in FIG. 4. Displacement of the type face into the platen is plotted as the ordinate and displacement of the type face across the platen is plotted as the abscissa. The type face first contacts the platen at the point 0 on the curve while moving at the velocity V_r. At the same time, of course, the arm 18 also contacts the stop element 43. Then the type face penetrates into the platen a distance y while moving across the platen a distance x to the point p on the curve. (The distance 0–x is to be kept to a minimum to prevent blurring during entry of the type face into the platen.) Upon reaching the point p, the motion of the type face is reversed by the stop element 43 and the disc assembly rebound therefrom at a velocity which reaches the magnitude and direction of V'_r at the point x' where the type face passes the surface at which it originally contacted the platen. However, it is important to note that while moving from the point p (the maximum point of penetration) to the point x' the type face is not in contact with the platen 10 because the relatively inelastic platen 10 lags behind the type face during the rebound.

Therefore, as a result of incorporating stop element 43 in the apparatus, the contact time between the type face and the platen is only the time required for the type face to move the distance 0–p along the curve. This is less than half the time required if the stop element were not used to effect the rebound and the type face stayed in contact with the platen during the rebound (from p to x' on the curve). Hence, the stop element 43 has the

ability to minimize printing contact time and thus improve the quality of the printed characters.

In addition, the impact of the disc assembly is taken up primarily by the stop element 43 rather than by the platen 10 so that this reduction in contact time does not unduly stress the platen. Yet there is no possibility that the stop element 43 will itself be damaged by the impact of the disc assembly because the area of contact at the portion 44 of the arm 18 can be sufficiently extensive to reduce the resulting stress well below maximum limits.

It is also important to note that when the disc 14 rotates in a direction opposite to the displacement of the arm 18 during printing, the incoming velocity V_r of the type face is closest to perpendicular. This condition is also made possible by rotating the disc 14 at a lesser angular velocity than that of the arm 18 during printing such that the velocity V_d of the type face relative to the center line of the disc is less than the velocity V_a of the type face relative to the point of pivot of the arm 18. If the motion of the type face does not have a component V_a opposite to V_d, then the incoming portion of the curve 0–*p* would be lengthened until the curve is symmetrical. Since this portion 0–*p* represents contact between type face and platen, such lengthening causes an increase in blurring. Consequently, the retrograde rotation of the disc contributes further to the quality of the printing.

In FIG. 5, a modification of the stop element is shown in detail. An arm 50 is adapted to be periodically pivoted about a shaft 51 as in the previously described structure. The arm 50 rotatably supports a type face-bearing disc 52 (shown in dotted lines) which normally is spaced from a platen 53 (also shown in dotted lines). A tension spring 54 urges the arm 50 against an abutting element 55.

As in the previous embodiment, a portion 56 of the arm 50 is adapted to collide with a stop element 58 mounted on a frame 59 at substantially the same time the disc 52 comes into printing contact with the platen 53. However, means are provided for varying the time of contact between the arm 50 and stop element 58 relative to the time of contact between the disc 52 and platen 53 and also for varying the elasticity of the stop element 58. Thus, the stop element is made up of a pair of slightly resilient bars 60 and 61 which are placed apart side-by-side and rigidly interconnected at one end portion 62. An adjustment screw 63 interconnects the opposite ends of the bars 60 and 61. The bars 61 fits within a slot in the frame 59 and can be affixed at various positions in the slot by a screw 64. The bar 60 is disposed such that it is struck intermediate its ends by the portion 56 of the arm 50.

By turning the adjustment screw 63, the bar 60 may be deflected toward or away from the bar 61 so that the arm 50 collides with the bar 60 at different points in time relative to the collision between the disc 52 and platen 53. This permits variation in the depth of penetration of the type face into the platen and is useful in typing different numbers of copies. By locking the bar 61 at different positions in the slot in the frame 59 (by means of the screw 64) various points of collision may be presented to the portion 56 of the arm. If the stop element is moved to the left as shown in FIG. 5, the elasticity of the stop element (or, more particularly of the bar 60) is decreased because the portion 56 of the arm 50 strikes the bar 60 at a point further removed from the rigid connecting portion 62. Conversely, if the stop element is moved to the right as shown in FIG. 5, the portion 56 of the arm 50 strikes the bar 60 at a point closer to the connecting portion 62 and thus the elasticity is increased. This adjustment permits even closer control to be maintained over the depth of penetration of the type face into the platen.

Referring now to the modification shown in FIG. 6, an arm 65 is again adapted to be pivoted about a shaft 66 to displace a disc 67 (shown in dotted lines) toward a platen 68 (also shown in dotted lines). Moreover, the arm 65 is urged toward a frame 70 by means of a tension spring 71 such that the arm rests against an abutting element 72.

A stop element 73 is provided in this modification which differs from those previously discussed in that no collision occurs between it and the arm 65. Magnet elements 75 and 76 are mounted on the arm 65 and frame 70, respectively, with surfaces of like polarity opposed to one another. The strength of these magnet elements 75 and 76 is such that the force of repulsion between the opposed surfaces is sufficient to reverse the motion of the arm 65, substantially as elastically as in the previous embodiments, at the same time the type face strikes the platen. This structure is characterized in that both the platen and the stop element are isolated from impact. In many instances, the resulting reduction in vibrations in the apparatus frame may be quite advantageous.

The apparatus shown in FIG. 7 differs from the embodiments of FIGS. 1 and 2 not in the construction of the stop element but rather in the mechanism used for selectively displacing the disc assembly towards the platen. Again, a disc 78 and platen 79 (both shown in dotted lines) are spaced apart and the disc is rotatably mounted on the end of arm 80. The arm 80 is pivoted about a shaft 81 and, by any suitable means, constant rotation is imparted to a shaft 82 supporting the disc 78.

Supported on a frame 84 adjacent the arm 80 is an electromagnet 85 which is adapted to be normally energized by a coil 86. Through suitable circuitry, the coil 86 may be de-energized by the various keys on a keyboard 87 when the appropriate type face on the disc 78 is approaching the platen. A permanent magnet may be used in place of the core of the electromagnet 85 and circuitry provided to de-energize the magnet when a suitable current is passed through the coil 86. The poles of the electromagnet 85 are spaced a very slight distance apart in the normal position of the apparatus from an armature 89 of magentic material affixed to the arm 80. A spring 90 interconnects the frame 84 and the end of the arm 80 and a stop element 91 (of any of the types described previously) is mounted on the frame to reverse the motion of the arm 80 substantially at the same time the type face contacts the platen 79.

In this apparatus, the spring 90 is in compressed condition when the arm 80 is in normal position spaced from the stop element 91. The electromagent 85 is normally energized and this urges the arm 80 against the force of the spring 90 to compress it. Upon selective de-energization of the electromagnetic coil 86, the force of attraction between the electromagnet 85 and the armature 89 on the arm 80 is suddenly eliminated with the result that the spring 90 expands to drive the arm 80 rapidly towards the stop element 91. Before the arm 80 strikes the stop element 91, the spring 90 may pass from compression to tension but the momentum of the disc assembly carries the arm 80 further into contact with the stop element 91 at the same time the type face strikes the platen 79. In rebounding from the stop element 91, the arm 80 may be assisted by the spring 90 (which may now be in tension) so that it withdraws very rapidly. Again, the momentum of the disc assembly causes the arm 80 to compress the spring 90 once again and before the momentum of the assembly is expended the arm 80 is recaptured by the electromagnet 85 in the position shown in FIG. 7.

One of the major advantages of this spring-propelled means for displacing the disc assembly is that the amplitude of the spring is independent of its period. Thus, variations in the starting position of the arm 80 (because of wear, dirt, and so on) do not affect the time required for displacement into printing contact.

The stop means 91 is of particular advantage in this embodiment because it rebounds the disc assembly substantially to its starting position for easy recapture of the

disc assembly by the magnet 85. Hence, the magnet 85 need not be impractically large.

It is quite obvious that various modifications can be made in the basic inventive concept described herein without departing from the scope of the invention. For example, the platen may be displaced into contact with the disc, rather than the converse described herein. In that case, the stop element would impede and reverse the motion of the platen rather than the disc assembly. There are, of course, many other substitutions which may be made in the new method and apparatus which are understood to be fully covered by the following claims.

A further variation within the scope of the invention is to support the constantly rotating disc on the movable end of a shaft having an elbow intermediate its ends. The arm is then adapted to pivot the disc-supporting end of this shaft toward the platen during each printing operation. In such case, the elbow is in the form of a universal joint to transmit constant rotation from the shaft to the disc. The principles of operation otherwise remain substantially the same since the arm still displaces the shaft laterally but in a pivotal manner rather than a full lateral translation as described previously.

I claim:

1. Typewriting apparatus comprising a frame, a platen mounted on said frame, a rotatable disc adjacent said platen, a plurality of type faces disposed about the periphery of said disc, a first shaft affixed coaxially to said disc, a second shaft rotatably mounted on said frame and extending alongside said first shaft, means for constantly rotating both of said shafts, a selectively engageable clutch on said second shaft comprising driving and driven elements, an arm extending rigidly from said driven element and being in rotatable engagement with said first shaft, means for selectively momentarily engaging said clutch to pivot said arm and being one of the type faces into printing contact with said platen, and stop means on said frame for reversing the motion of said arm at substantially the same time the type face contacts said platen, said stop means being adapted to accomplish this reversal of motion in substantially less time than it would take for said type face to rebound from the platen alone.

2. Typewriting apparatus comprising a frame, a platen mounted on said frame, a rotatable disc adjacent said platen, a plurality of type faces disposed about the periphery of said disc, a first shaft affixed coaxially to said disc, a second shaft rotatably mounted on said frame and extending parallel alongside said first shaft, a motor on said frame for constantly rotating said second shaft, transmission means for interconnecting said shafts for rotating said first shaft, a selectively engageable electrically operative clutch on said second shaft comprising driving and driven elements, an arm extending rigidly from said driven element and being in rotatable engagement with said first shaft, commutator means associated with said first shaft for selectively momentarily engaging said clutch to pivot said arm and said disc toward said platen to bring one of the type faces into printing contact with said platen, and stop means on said frame for reversing the motion of said arm at substantially the same time the type face contacts said platen, said stop means being adapted to accomplish this reversal of motion in substantially less time than it would take for said type face to rebound from the platen alone.

3. Apparatus according to claim 1 wherein said stop means comprises magnet elements mounted on said arm and frame respectively with surfaces of like polarity opposed to one another, and means for urging said arm away from said platen, said magnet elements being adapted without colliding to reverse the motion of said arm at substantially the same time the type face contacts the platen.

4. Typewriting apparatus comprising a frame, a platen mounted on said frame, a rotatable disc adjacent said platen, a plurality of type faces disposed about the periphery of said disc, a first shaft affixed coaxially to said disc, a second shaft rotatably mounted on said frame and extending parallel alongside said first shaft, a motor on said frame for constantly rotating said second shaft, gear and pinion means interconnecting said shafts for rotating said first shaft, a selectively enageable electrically operative clutch on said second shaft comprising driving and driven elements, an arm extending rigidly from said driven element and being in rotatable engagement with said shaft, commutator means for momentarily engaging said clutch to displace said arm and said disc toward said platen to bring one of the type faces into printing contact with said platen, and a stop element mounted on said frame, said arm being adapted to collide with said stop element at substantially the same time said type face contacts said platen, said stop element being substantially more elastic than said platen.

5. Apparatus according to claim 4 wherein said arm is pivoted toward said platen in a direction opposite to the direction of rotation of said disc.

6. Apparatus according to claim 5 wherein the tangential velocity of the type face contacting said platen relative to the center of said disc is less than the tangential velocity of that type face relative to the point of pivot of said arm.

7. Apparatus according to claim 4 wherein said stop element includes adjustment means for varying the depth of penetration of the type face into said platen.

8. Apparatus according to claim 7 wherein said adjustment means comprises a pair of slightly resilient bars spaced apart side-by-side and cojoined at one end, said arm being adapted to collide with one of said bars between the ends thereof, an adjustment screw interconnecting the opposite ends of said bars for varying the space between them, and a slidable mount for displacing said stop element so that said arm collides at various points relative to the cojoined ends of said bar.

9. In typewriting apparatus wherein type faces on a constantly rotating disc are adapted to be brought into printing contact with a platen by selective relative displacement toward said platen of a member supporting said disc, the improvement which comprises a frame and stop means mounted thereof, said stop means comprising magnet elements mounted on said member and frame respectively with surfaces of like polarity opposed to one another, and means for urging said member away from said platen, said magnet elements being adapted without colliding to reverse the motion of said member at substantially the same time the type face contacts the platen, said stop means being adapted to accomplish this reversal of motion in substantially less time than it would take for the type face to rebound from the platen alone.

10. Typewriting apparatus comprising a frame; a platen mounted on said frame; a rotatable disc adjacent said platen; a plurality of type faces disposed about the periphery of said disc; an arm pivoted on said frame and supporting said rotatable disc; means for selectively displacing said arm toward said platen to bring one of the type faces into printing contact with said platen; and a stop element mounted on said frame, said arm being adapted to collide with said stop element at substantially the same time the type face contacts said platen, said stop element being substantially more elastic than said platen; said means for displacing said arm comprising an armature of magnetic material on one of said frame and said arm remote from the pivot point thereof, a selectively deenergizable magnet opposed to said armature on the other of said frame and said arm remote from the pivot point thereof, and a spring normally in compression interconnecting said arm and said frame, whereby said spring urges said arm into contact with said stop element when said magnet is momentarily deenergized and said magnet regrips said arm after said arm rebounds from said stop element.

11. Typewriting apparatus comprising a frame, a

platen mounted on said frame, a rotatable disc adjacent said platen, a plurality of type faces disposed about the periphery of said disc, a first shaft affixed coaxially to said disc, a second shaft rotatably mounted on said frame and extending substantially alongside said first shaft, means for constantly rotating both of said shafts, a selectively engageable clutch on said second shaft comprising driving and driven elements, an arm extending rigidly from said driven element and being in rotatable engagement with said first shaft, and means for selectively momentarily engaging said clutch to pivot said arm and bring one of the type faces into printing contact with said platen.

12. Typewriting apparatus comprising a frame, a platen mounted on said frame, a rotatable disc adjacent said platen, a plurality of type faces disposed about the periphery of said disc, a first shaft affixed coaxially to said disc, a second shaft rotatably mounted on said frame and extending parallel alongside said first shaft, a motor on said frame for constantly rotating said second shaft, transmission means for interconnecting said shafts for rotating said first shaft, a selectively engageable electrically operative clutch on said second shaft comprising driving and driven elements, an arm extending rigidly from said driven element and being in rotatable engagement with said first shaft, and commutator means associated with said first shaft for selectively momentarily engaging said clutch to pivot said arm and said disc toward said platen to bring one of the type faces into printing contact with said platen.

13. Typewriting apparatus comprising a frame, a platen mounted on said frame, a rotatable disc adjacent said platen, a plurality of type faces disposed about the periphery of said disc, a first shaft affixed coaxially to said disc, a second shaft rotatably mounted on said frame and extending substantially alongside said first shaft, means for constantly rotating both of said shafts, a selectively engageable clutch on said second shaft comprising driving and driven elements, an arm extending from said driven element and being in rotatable engagement with said first shaft, and means for selectively displacing said arm toward said platen in a direction opposite to the direction of rotation of said disc to bring one of the type faces into printing contact with said platen.

14. Typewriting apparatus comprising a frame, a platen mounted on said frame, a rotatable disc adjacent said platen, a plurality of type faces disposed about the periphery of said disc, a first shaft affixed coaxially to said disc, a second shaft rotatably mounted on said frame and extending substantially alongside said first shaft, means for constantly rotating both of said shafts, a selectively engageable clutch on said second shaft comprising driving and driven elements, an arm extending from said driven element and being in rotatable engagement with said first shaft, means for selectively momentarily engaging said clutch to displace said arm and said disc toward said platen in a direction opposite to the direction of rotation of said disc to bring one of the type faces into printing contact with said platen, and stop means mounted on said frame, said stop means being adapted to reverse the motion of said arm at substantially the same time the type face contacts the platen, said stop means being adapted to accomplish this reversal of motion in substantially less time than it would take for the type face to rebound from the platen alone.

15. Typewriting apparatus comprising a frame, a platen mounted on said frame; a rotatable disc adjacent said platen; a plurality of type faces disposed about the periphery of said disc; an arm pivoted on said frame and supporting said rotatable disc; means for selectively displacing said arm toward said platen in a direction opposite to the direction of rotation of the disc to bring one of the type faces into printing contact with said platen; stop means mounted on said frame, said stop means being adapted to reverse the motion of said arm at substantially the same time the type face contacts the platen, said stop means being adapted to accomplish this reversal of motion in substantially less time than it would take for the type face to rebound from the platen alone; said means for selectively displacing said arm comprising an armature of magnetic material on one of said frame and said arm remote from the pivot point thereof, a selectively deenergizable magnet opposed to said armature on the other of said frame and said arm remote from the pivot point thereof, and a spring normally in compression interconnecting said arm and said frame, whereby said spring urges said arm toward said stop means when said magnet is momentarily deenergized and said magnet regrips said arm after said arm returns from said stop means.

16. Typewriting apparatus comprising a frame; a platen mounted on said frame; a constantly rotatable disc adjacent said platen; a plurality of type faces disposed about the periphery of said disc; an arm pivoted on said frame and supporting said rotatable disc; means for selectively displacing said arm toward said platen in a direction opposite to the direction of rotation of said disc to bring one of the type faces into printing contact with said platen comprising an armature of magnetic material on one of said frame and said arm remote from the pivot point thereof, a selectively deenergizable magnet opposed to said armature on the other of said frame and said arm remote from the pivot point thereof, and a spring normally in compression interconnecting said arm and said frame; and stop means mounted on said frame adapted to reverse the motion of said arm at substantially the same time the type face contacts the platen, said stop means being adapted to accomplish this reversal of motion in substantially less time than it would take for the type face to rebound from the platen alone; whereby said spring urges said arm toward said stop means when said magnet is momentarily deenergized and upon being immediately reenergized said magnet regrips said arm after said arm returns from said stop means.

References Cited in the file of this patent

UNITED STATES PATENTS

1,458,125	Barney	June 12, 1923
1,553,765	Fischer	Sept. 15, 1925
2,328,638	Fuller et al.	Sept. 7, 1943
2,675,108	Ruderfer	Apr. 13, 1954
2,770,188	Nolan	Nov. 13, 1956
2,790,381	Miossec et al.	Apr. 30, 1957
2,799,221	Olivetti	July 16, 1957
2,940,385	House	June 14, 1960
2,981,178	Bender	Apr. 25, 1961

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,077,256 February 12, 1963

Martin Ruderfer

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 2, line 45, for "digrammatic" read -- diagrammatic --; line 57, for "ribobn" read -- ribbon --; column 5, line 63, for "left" read -- right --; line 68, for "right" read -- left --; column 7, line 36, for "being" read -- bring --; column 8, line 10, before "shaft" insert -- first --.

Signed and sealed this 10th day of September 1963.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

DAVID L. LADD
Commissioner of Patents