United States Patent [19]

Holland

[11] **3,757,346**

[45] **Sept. 4, 1973**

[54] **PRINTING METHOD**

[75] Inventor: **Terence John Holland**, Seaford, England

[73] Assignee: **International Standard Electric Corporation**, New York, N.Y.

[22] Filed: **Oct. 5, 1972**

[21] Appl. No.: **295,154**

[30] **Foreign Application Priority Data**

Oct. 7, 1971 Great Britain 46,705/71

[52] **U.S. Cl.** ..... **346/1**, 178/30, 197/1 R, 346/141

[51] **Int. Cl.** **G06k 15/10**

[58] **Field of Search** ..... 346/1, 141; 178/30; 197/1 R

[56] **References Cited**

UNITED STATES PATENTS

2,457,133	12/1948	Deloraine	178/30
3,157,456	11/1964	Kikuchi	346/141 X
3,627,096	12/1971	Finnegan	197/1

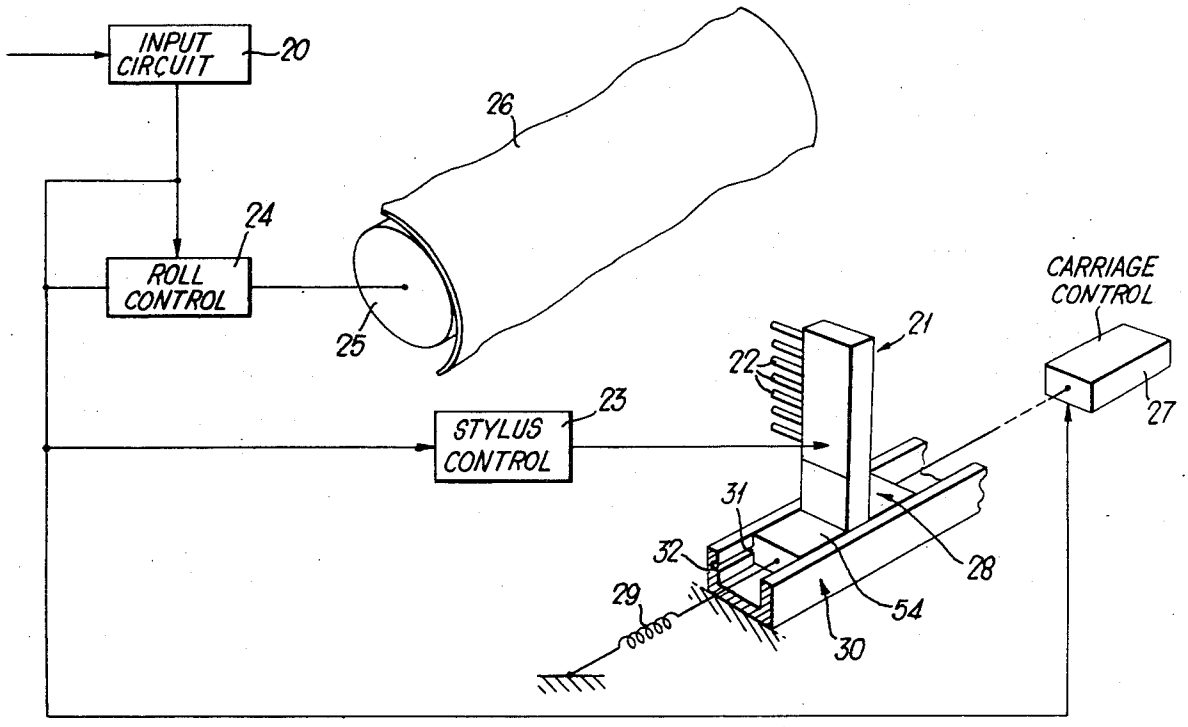
Primary Examiner—Joseph W. Hartary

Attorney—C. Cornell Remsen, Jr., Thomas E. Kristofferson et al.

[57] **ABSTRACT**

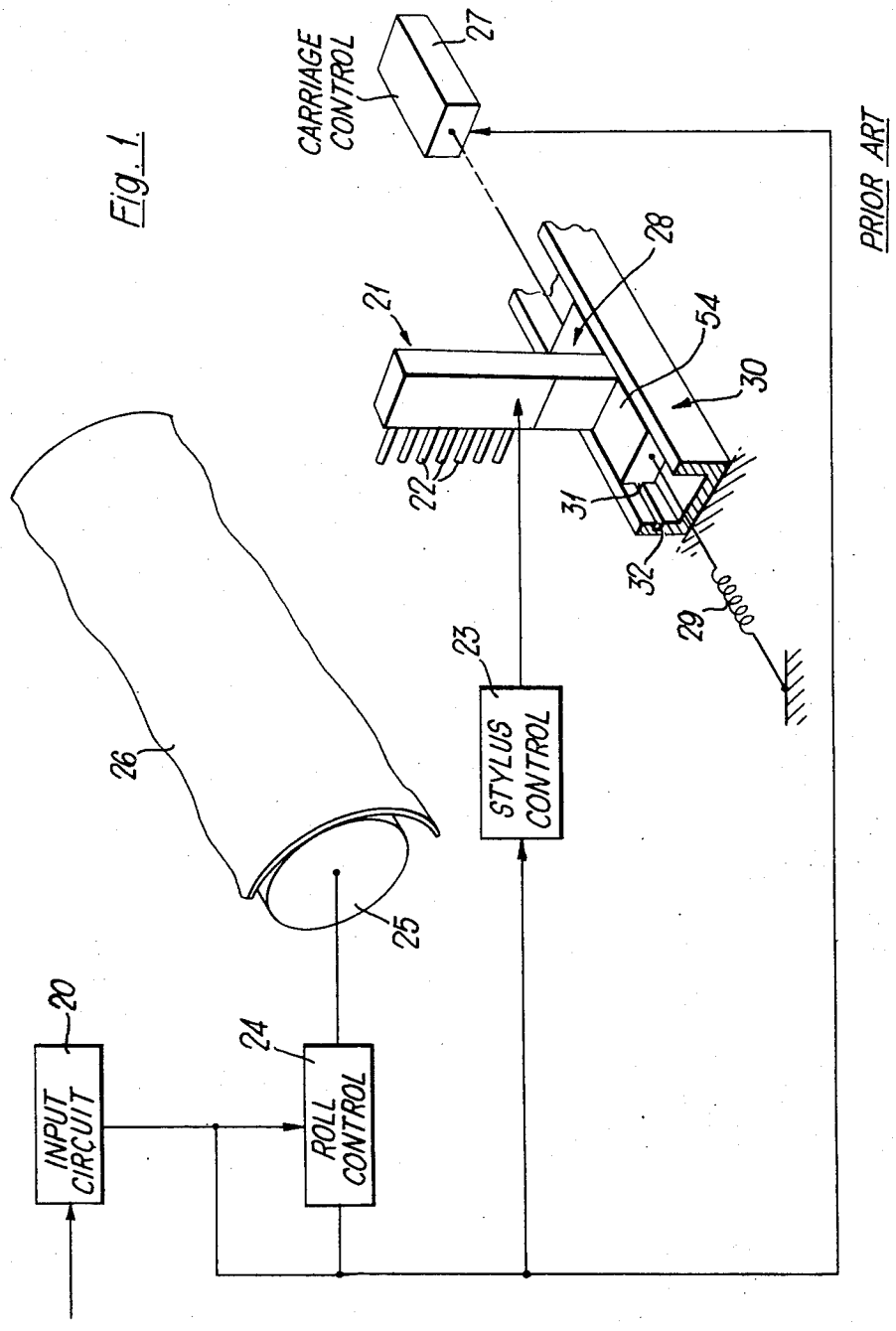
A method of printing mosaic characters which may be used in telegraphic printers, wherein a column of styli are employed twice at two different vertical locations to print a single column or partial column of dots. The number of individual styli and the actuators therefor are thus halved over those required in prior art stylus heads. The complexity and size of the styli and actuators make this a substantial advantage.

3 Claims, 14 Drawing Figures



PRIOR ART

Fig. 1


CARRIAGE CONTROL
27
28
21
54
30
22
31
32
29
23
STYLUS CONTROL
26
25
20
INPUT CIRCUIT
24
ROLL CONTROL
PRIOR ART

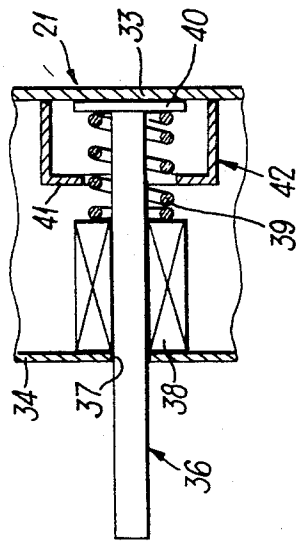


Fig. 2.

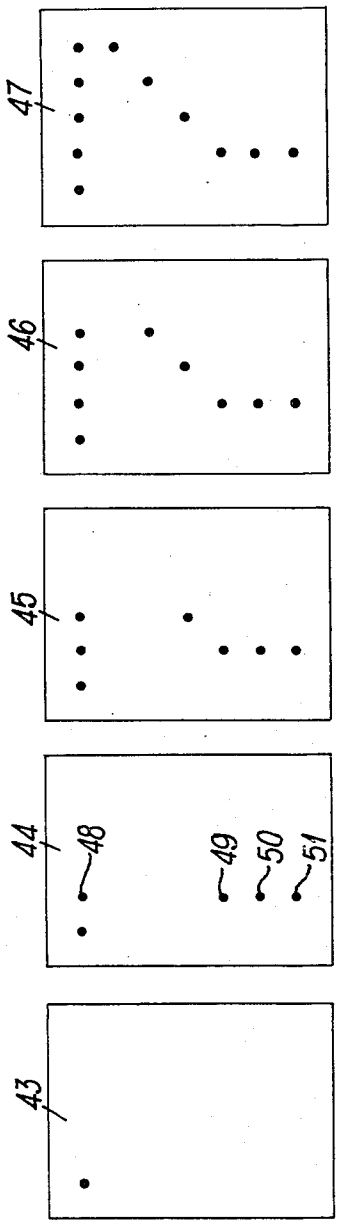


Fig. 3.

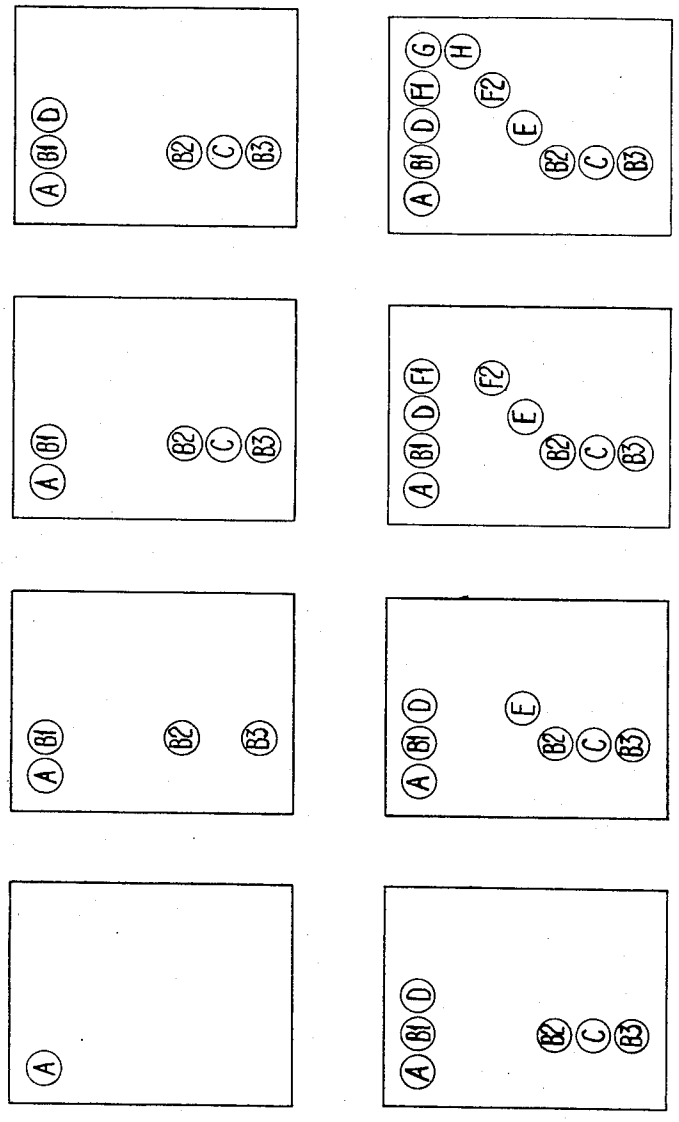

A
A B1
A B1 B2 B3
A B1 D B2 C B3
A B1 D E B2 C B3
A B1 D F1 E B2 C B3
A B1 D F1 F2 E B2 C B3
A B1 D F1 G H F2 E B2 C B3

Fig. 4

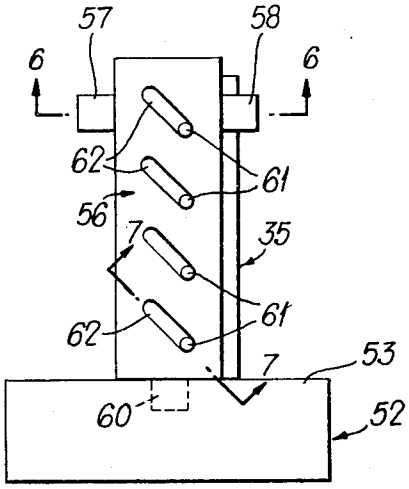


Fig. 5.

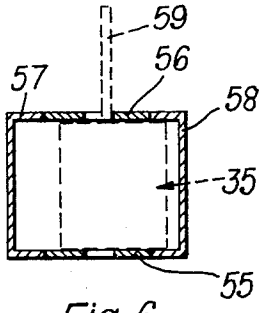


Fig. 6.

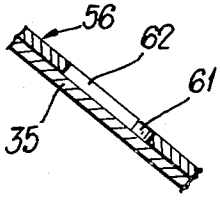


Fig. 7.

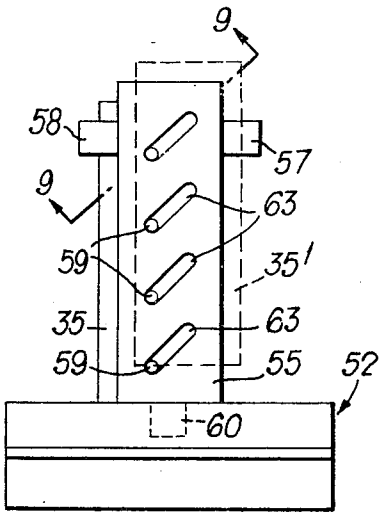


Fig. 8.

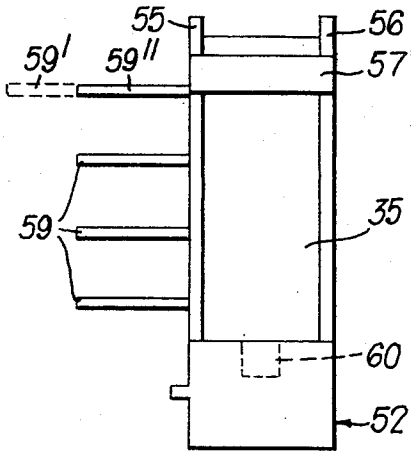


Fig. 10.

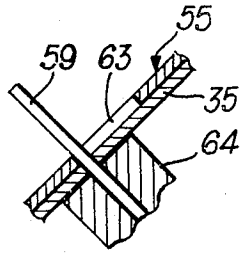


Fig. 9.

Fig. 11.

Fig. 12.

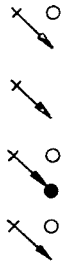


Fig. 13.

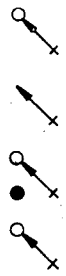


Fig. 14.

PRINTING METHOD

BACKGROUND OF THE INVENTION

This invention relates to the art of serial printing, and more particularly, to a method of printing mosaic characters.

In the past it has been the practice to print a mosaic character by employing a vertical column of styli equal to the character height and printing no dots or one or more dots by styli actuation at each of a plurality of horizontally spaced column over a character width. A column from seven to fifteen styli may be employed at from five to nine of the said horizontal locations. The styli spacing is conventionally uniform. So is the location spacing. These two may be euqal, if desired.

Due to the fact that the styli and actuators therefor are relatively large in size and complex, it is often difficult and expensive to package and to manufacture such equipment.

SUMMARY OF THE INVENTION

In accordance with the method of the present invention, the above-described and other disadvantages of the prior art are overcome by using the styli twice. The present invention thus requires only one-half the number of styli and styli actuators conventionally required. Difficulty and expense in packaging and construction are thus avoided.

The above-described and other advantages of the prevent invention will be better understood from the following detailed description when considered in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings which are to be regarded as merely illustrative:

FIG. **1** is a diagrammatic view of a conventional mosaic printer;

FIG. **2** is a sectional view of a portion of a stylus head which may be employed with the present invention;

FIG. **3** is a top plan view of a portion of a recording medium in five states of the development of a mosaic character thereon, the character being the numeral **7**;

FIG. **4** is a top plan view of a portion of a recording medium showing the sequence in which dots are added thereto in accordance with the present invention to provide a mosaic character, the character being the numeral **7**;

FIG. **5** is a rear elevational view of a carriage and stylus head constructed in accordance with the present invention;

FIG. **6** is a transverse sectional view taken on the line **6—6** of the apparatus shown in FIG. **5**;

FIG. **7** is a sectional view taken on the line **7—7** through the apparatus shown in FIG. **5**;

FIG. **8** is a front elevational view of the carriage and stylus head shown in FIG. **5**;

FIG. **9** is a sectional view taken on the line **9—9** of the apparatus shown in FIG. **8**;

FIG. **10** is a right end elevational view of the apparatus shown in FIG. **8**; and

FIGS. **11, 12, 13** and **14** are diagrams illustrating the succession of printing and certain possible motions of the stylus head shown in FIG. **8**.

DESCRIPTION OF THE PREFERRED EMBODIMENT

A conventional prior art mosaic printer is shown in FIG. **1** including an input circuit **20** which receives and stores, for example, a serial binary code which determines which, if any, of a plurality of styli in a column are employed to print dots on a recording medium. Input circuit **20** thus controls a stylus head **21** and the individual styli thereof through a stylus control **23**. Input circuit **20** also controls a roll control **24** for a roll **25** which supports a recording medium **26** such as inked paper. Input circuit **20** also controls a carriage control **27** which pulls a carriage **28** in a direction to the right, as viewed in FIG. **1**, against the force of a spring **29** which is fixed at its left end connected to carriage **28** at its right end. Head **21** is fixed to carriage **28**. Carriage **28** has a single guide **30** in which carriage **28** is guided by a tongue **31** that fits in a groove **32** of channel **30**.

As shown in FIG. **2**, stylus head **21** includes a rear wall **33** and a front wall **34**. Except as otherwise provided herein, the stylus head of the present invention shown at **35** in FIG. **5** may be identical to stylus head **21** shown in FIGS. **1** and **2**.

In FIG. **2**, a stylus **36** is slidable through a hole **37** in wall **34**. A solenoid winding **38** is fexed to wall **34**. Stylus **36** is thus slidable through winding **38**. A coiled spring **39** rests against the right end of winding **38** and urges stylus **36** in a direction toward wall **33**. Stylus **36** has a flange **40** fixed to the end thereof which is pressed against wall **33** by spring **39**. Movement of stylus **36** in a direction to the left, as viewed in FIG. **2**, is stopped by engagement of flange **40** with a flange **41** on a cylinder **42** fixed to wall **33**.

In the prior art, and in accordance with the present invention, dots may be made on paper **26** either by the impact of the end of a stylus thereagainst, or by producing a rocking motion of channel **30** shown in FIG. **1**.

In the prior art, a mosaic character may be formed as shown in FIG. **3**. The same portion of a recording medium is illustrated at **43, 44, 45, 46** and **47**. It will be understood when no selenoid corresponding to solenoid **38** in FIG. **2** is energized for any of the styli **22** shown in FIG. **1**, a space will be left on the recording medium. However, this space will not be one character space, but, for example, may be only one-fifth of a character space. When one or more dots in one column are produced, all of these dots may be made simultaneously.

As shown in FIG. **3**, the dot in rectangle **43** is made before the other dots are made. Dots **48, 49, 50** and **51** then may be made simultaneously thereafter. One or more additional dots are added in each column until the numeral seven is portrayed in rectangle **47**.

In accordance with the present invention, the succession of dots shown in FIG. **3** is not made. In lieu thereof, dots are made at the letter and reference numeral locations shown in FIG. **4**. As will be evident from the explanation of FIGS. **11, 12, 13** and **14**, and other embodiments of the disclosure disclosed herein, variations of the sequence disclosed in FIG. **4** may be employed.

In FIG. **4**, some dots may be made, if desired, simultaneously whereas other dots may be made consecutively. In the specific embodiment of FIG. **4**, dot A is made first. All the dots B are made after dot A has been

made. However, all the dots B may be made simultaneously. Dot C is then made after all the dots B have been made. Dot D is made after dot C has been made. Dot E is made after dot D is made. Dots F are made after dot E is made. However, both of the dots F may be made simultaneously. Dot G is made after the dots F are made. Dot H is made after the dot G is made.

Apparatus for accomplishing several embodiments is shown in FIGS. **5–10**, inclusive. In FIG. **5**, a carriage is shown at **52**. Carriage **52** may have a base portion **53** identical to base portion **54** of carriage **28**. Carriage **52** has front and rear plates **55** and **56**, respectively, as shown in FIGS. **5** and **6**, which are held together by U-shaped braces **57** and **58** fixed thereto. Stylus head **35** has a styli **59**. Stylus head **35** is movable vertically between plates **55** and **56** at an angle by a solenoid operator **60** shown in FIG. **5**. Stylus head **35** has four pins **61** fixed thereto which slide in four respective slots **62** through rear plate **56**. See FIG. **7**.

As shown in FIG. **8**, energization of solenoid **60** can cause movement of stylus head **35** from the solid line position shown in FIG. **8** to the dotted line position **35'** shown therein.

As shown in FIG. **8**, four slots **63** may be provided for the four styli **59**, slots **63** being provided through front plate **55**. See also FIG. **9**. In FIG. **9**, a solenoid winding is shown at **64** fixed to stylus head **35** around a stylus **59**.

As shown in FIG. **10**, when the solenoid winding corresponding to stylus **59''** is energized, it may be extended to the position shown in dotted lines at **59'**.

In accordance with the present invention, it is not highly critical when solenoid **60** is energized. When it is energized, it may lift stylus head **35** to the position shown in dotted lines at **35'** in FIG. **8**. It is not highly critical exactly when solenoid **60** is energized during the movement of the column of styli **59** by a control, such as carriage control **27** shown in FIG. **1**. However, if solenoid **60** and control **27** are moved simultaneously, stylus **59** may simply lower or raise at a single, stationary horizontal location.

In FIG. **11**, the solid dots which are recorded first. Styli **59** are then moved by the carriage control to the *x* position in FIG. **11**. Solenoid **60**, when deenergized, will then move the styli **59** to the ends of the arrows in FIG. **11** to record the dot at the circle in FIG. **4**. The circle in FIG. **4** is employed to represent the dot which is recorded last in its column. As an example, all the dots, both first and second recorded, in FIGS. **11, 12, 13** and **14** may be the dots **B1, B2, C** and **B3** in FIG. **4**.

In FIG. **11**, after the last dot has been recorded, the styli **59** return to the *x* position, and the first set of dots to be recorded in that column is then recorded next.

An alternative recording method is to first record the filled in dots in FIG. **12**. This is accomplished by shifting head **35** in an upward right-hand direction as indicated by the arrows in FIG. **12** and then recording. Solenoid **60** may then may be deenergized and the styli return to the *x* positions shown in FIG. **12**. The dot at the circle not filled in in FIG. **12** is recorded second after a right-hand shift has been made by the carriage control.

In FIG. **13**, the filled in dot in the column of dots is filled in first by making a shift by deenergizing the solenoid **60** and then causing a, for example, one-fifth character space to be made by energization of the carriage control. Dots at the position of the circles in FIG. **13** are then made after the filled in dot in FIG. **13** is made.

Still another method of recording is to first record the solid dot in FIG. **14**. The carriage control is then operated to move the styli **59** to the *x* position shown in FIG. **14** from which head **35** is moved by energization of solenoid **60** to the positions at the arrowheads shown in FIG. **14**. Dots are then recorded at the circles shown in FIG. **14**. Solenoid **60** is then deenergized to allow the recording of none, one or more dots in the *x* column in FIG. **14**.

It is to be noted that the method of the present invention may be performed manually by manually energizing the styli solenoids, the carriage control and solenoid **60**. Morever, the method of the present invention may be performed automatically.

Note will also be taken that many of the views herein are greatly enlarged.

From the foregoing, it will be appreciated that it is possible to substantially reduce the size and complexity of the stylus head **35**. This is true because only four styli **59** are required to produce a column of eight dots. However, it is to be noted that any number of the styli may be employed to produce twice as many dots in a single column.

What is claimed is:

1. The method of printing at least a portion of a mosaic character, said method comprising the steps of: moving a vertical column of styli to a first printing location adjacent a recording medium, said styli having uniform vertical spacing; causing at least a first selected one of said styli to print a dot on said medium at the position of said first selected stylus; moving said styli vertically to a second location a distance equal to one-half said styli vertical spacing; and causing at least a second selected one of said styli to print a dot on said medium at the position of said second selected stylus, all of said steps being performed sequentially in the order stated.

2. The invention as defined in claim **1**, wherein said second location is below said first location.

3. The invention as defined in claim **1**, wherein said second location is above said first location.

* * * * *