PATENT SPECIFICATION

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COMPLETE SPECIFICATION

An improved method of and apparatus for Defining Characters on Impression-Receiving Material

We, POWERS - SAMAS ACCOUNTING MACHINES LIMITED, a Company Incorporated under the laws of Great Britain, of Powers-Samas House, Holborn Bars, London, E.C.1, England, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to an improved method of and apparatus for defining characters on impression-receiving material.

It is a main object of the invention to provide a method of and apparatus for automatically effecting the definition of characters on impression-receiving material, e.g. paper, at a relatively high speed and in carrying the invention into effect one or more styluses is or are employed, each stylus being capable of defining any one of a predetermined number of characters. By a "relatively high speed" is to be understood the capacity of a stylus or of each stylus to define characters at a rate of 150 or more characters per minute.

According to the present invention there is provided a method of defining characters on impression-receiving material, e.g. paper, consisting of the steps of positioning impression-receiving material for engagement by any one of a plurality of styluses arranged in side-by-side relation for independent lengthwise movement, determining the maximum height and maximum width of a character by moving the marking ends of all styluses simultaneously in two paths normal one to the other, and during said simultaneous movements applying discrete impulses to the styluses to effect lengthwise movements thereof to cause their marking ends to make character-defining marks in a single line on the impression-receiving material.

Further according to the invention there is provided for defining characters on impression-receiving material, e.g. paper, apparatus comprising a platen, a plurality of styluses supported for independent movement lengthwise towards and away from the platen and in side by side relation in a line extending lengthwise of the platen, stylus reciprocating means operable simultaneously to move the marking ends of all styluses in two paths normal one to the other thereby to determine the maximum height and maximum width of a character, and actuating means operable during said simultaneous movement of the marking ends of the styluses to apply discrete impulses to the styluses to effect lengthwise movements thereof to cause their marking ends to make character-defining marks on impression-receiving material disposed between the platen and the marking ends of the line of styluses.

The stylus reciprocating means may comprise a first guide element operable to move the marking ends of the styluses in a path determining one maximum dimension of characters, a second guide element operable to move the marking ends of the styluses in a path normal to the path of said first guide element to determine the other maximum dimension of characters, and operating means to effect simultaneous operation of the first and second guide elements in a manner such that one said element is movable in its path a plurality of times during a single traverse in one direction by said other element.

In one embodiment of the invention each stylus may be formed by the inner wire of a flexible cable comprising a fixed outer member and an inner wire movable lengthwise relative thereto.

In order that the invention may be clearly understood one embodiment thereof will now be described, by way of example, with reference to the diagrammatic drawings accompanying the Provisional Specification and in which:—

Fig. 1 pictorially illustrates one form of apparatus for defining characters in accordance with the invention,

Fig. 2 is an elevation partly in section and illustrates means for effecting lengthwise movement of styluses,

[*Price 3s. 0d.*]

Fig. 3 is a pictorial view, on line III—III, Fig. 1, illustrating the manner in which a character is defined in accordance with the invention,

Fig. 4 illustrates a character disc for the letter "A," and,

Fig. 5 graphically illustrates the manner in which, under control of the disc shown in Fig. 4, a stylus defines the letter "A" on impression receiving material.

Referring to the drawings, the apparatus diagrammatically illustrated therein embodies a plurality of styluses each of which consists of a flexible wire 1, the wire 1 being the inner wire of a flexible cable which cable consists of the inner wire 1 and a flexible outer member 2 which outer member is a fixed member having its opposite ends clamped as indicated in Figs. 1 and 2. The inner wire 1 is movable lengthwise relative to the outer member 2 and extends therethrough to project beyond the opposite ends thereof so that the end 3, Fig. 3, thereof is the marking end while the opposite end 4, Fig. 2, of the wire is an impulse-receiving end which co-operates with the armature 5 of a moving coil solenoid 6 for movement lengthwise thereby.

The marking ends 3 of the flexible wires 1 are supported in side by side relation by the outer members 2 and are directed, as a line extending lengthwise of and towards a platen 7, Figs. 2 and 3, over which, in any suitable known manner, there is fed a web 8 of impression receiving material, such as paper, the feeding apparatus for which, as is customary, is arranged to feed the paper to successive line positions thereof, the paper being stationary during character-defining operations. Also over the platen 7 is fed a web 9 of transfer media such as a carbon ribbon or the like.

The marking ends 3 of the wires are supported by a first reciprocating guide element 10 and a second reciprocating guide element 11, the wires passing through apertures 12 in the guide element 11 to be engaged thereby. The first guide element 10 is, adjacent to the opposite ends thereof, provided with V-grooves each of which embraces a post 13, Fig. 1, so that the guide element 10 is slidable lengthwise of the posts. A pin 14 extends from each end of the first guide element 10 and is engaged in a slot 15 formed in a bell-crank lever 16 supported on a pivot 17. The bell-crank lever 16 carries a cam follower 18 which is urged towards a cam 19 by a spring 20. The cam 19 is rotatable with a shaft 21 which is continuously rotated in any suitable manner from the main drive of the machine, not shown.

The second guide element 11 has a tongue 22 extending lengthwise thereof, the tongue being housed in a groove extending lengthwise of the first guide element 10 so that the second guide element 11 is carried by the first guide element 10 and is supported for sliding movement lengthwise thereof and in a direction normal to the direction of movement of the first guide 10, as indicated by the double-headed arrows 23 and 24, Figs. 1 and 3. To one end of the second guide element 11 is connected an eccentric strap 25, Fig. 1, the strap 25 co-operating with an eccentric 26 rotated by a shaft 27, also continuously rotatable by any suitable means, not shown, from the main drive of the machine. The shafts 21 and 27 are rotated simultaneously and in timed relation in order that the movements of guide elements 10 and 11 in directions 23, 24 are effected simultaneously so that the guide elements move the marking ends 3 of the styluses 1 simultaneously in two paths normal one to the other, as determined by the cam 19 and eccentric 26. The arrangement is such that the reciprocating movement 23 of the first guide element 10 determine the maximum height of a character to be defined by a stylus 1 while the reciprocating movements 24 of the second guide element 11 determine the maximum width of the character.

The cam 19 and eccentric 26 are so timed that while the cam 19 is causing the guide element 10 to make a single traverse in one direction the eccentric 26 causes the guide element 11 to make a plurality of reciprocations 24. In the embodiment of the apparatus herein described it is assumed that while the guide element 10 makes one reciprocation 23 the guide element 11 makes eleven reciprocations 24. However, as can be seen from Fig. 5, the arrangement is such that discrete impulses are applied to the wires 1 only during the first eight of a cycle of eleven reciprocations 24, the remaining three reciprocations of the cycle being idle and representing the interval during which selection is made from a plurality of continuously rotating character discs, of which one 28 is illustrated in Fig. 4, to control the operation of solenoids 6. It will be understood that the ratio of 1:11 is given by way of example only and that other ratios can be employed to suit the nature of the work to be done.

As viewed in the drawings, the guide element 10 is making its downward stroke during character definition and at the end of its downward stroke, which is a steady movement from top to bottom as viewed in Fig. 5, the roller 18 drops from the peak of the cam down a step 29 formed thereon so that the return movement is a very quick movement. The quick return movement of guide element 10 is necessitated by the fact that it must be completed during the line-feeding operation of paper 8.

Each character disc 28 is electrically connected with each solenoid 6 and is provided with peripheral electrical contacts 27*a*- - - - - 27*cc* for co-operation with brushes, not shown, so that at intervals and for periods determined

by the contacts the solenoid 6 is energised and imparts discrete impulses to the impulse-receiving end 4 of wire 1 causing the wire to be moved lengthwise to impinge against the transfer media web 9 so that, according to the length of a contact, a dot or a line is marked on the paper web 8. In Figs. 4 and 5 the reference numerals 27*a*-----27*cc* indicate the contacts and the dots or lines marked as a result thereof, the contact 28*p* resulting in the marking of a line.

Although in the example given character-determining discs have been described as controlling the operation of solenoids 6 the manner of selection of the discs 28 for operation thereof forms no part of the present invention and is not illustrated in the drawings, it being understood that the electrical pulses to control operation of the solenoids 6 can, if desired, be obtained from sources other than discs 28.

On application of an electrical pulse to a solenoid 6, the armature 5 thereof, as mentioned above, effects lengthwise movement of the inner wire 1 so that the wire is impinged against the transfer media 9 and paper 8. It will be understood that the extent of lengthwise movement of the wire 1 is very short and after an impulse has been applied thereto the arrangement is such that the wires 30, Fig. 2, which connect the moving coil of the solenoid to terminals, not shown, act in conjunction with the tendency for wire 1 to straighten and the reactionary pressure exerted thereon by the impression-receiving material, which is under tension, to restore the wire 1 and armature 5 to the starting positions thereof.

The apparatus herein described is used in conjunction with a statistical machine controlled by records such as perforated record cards, or perforated tape, or by cards, tape other data-bearing media on which data is recorded by marks, for example marks having magnetic properties or light-absorbing properties, and from which the data is sensed to control the operations of the machine.

One form of statistical machine to which the apparatus may be applied is a tabulating machine, in which instance a stylus 1 may be controlled either directly as a result of the sensing of data from a record, or by a reading-out operation from an accumulator incorporated in the machine. The apparatus may, at some times, be controlled by records, and at other times by a reading-out operation from the accumulator.

Another form of statistical machine to which the apparatus can be applied is that form of statistical machine, known in the art as an interpreter, in which data sensed from a record is visually defined either on the record from which the data is sensed or on another record fed through the machine either in precedence to or succeeding the record from which the data is sensed.

In the embodiment of the invention described above the styluses have been described as flexible wires, but it will be understood that, if desired, a stylus can have a form other than that of a wire and may comprise a stylus which is provided with marking material so that it makes an impression by direct contact with the impression-receiving material, thus avoiding the necessity of the transfer media web 9 mentioned above. Thus the stylus may comprise a form of ball-point pen or it may be an element provided with a thin wick to which marking fluid is fed to effect the character-defining marks on the paper.

From the foregoing it will also be understood that during the definition of a character the paper 8 is stationary, the paper being fed as is customary to the individual line printing positions thereof between the printing of successive characters by the individual styluses and that, if desired, imprinting may be effected on sheets instead of on a web as hereinbefore described.

What we claim is:—

1. A method of defining characters on impression-receiving material, e.g. paper, consisting of the steps of positioning impression-receiving material for engagement by any one of a plurality of styluses, arranged in side by side relation for independent lengthwise movement determining the maximum height and maximum width of a character by moving the marking ends of all styluses simultaneously in two paths normal one to the other, and during said simultaneous movements applying discrete impulses to the styluses to effect lengthwise movements thereof to cause their marking ends to make character-defining marks in a single line on the impression-receiving material.

2. For defining characters on impression-receiving material, e.g. paper, apparatus comprising a platen, a plurality of styluses supported for independent movement lengthwise towards and away from the platen and in side by side relation in a line extending lengthwise of the platen, stylus reciprocating means operable simultaneously to move the marking ends of all styluses in two paths normal one to the other thereby to determine the maximum height and maximum width of a character, and actuating means operable during said simultaneous movements of the marking ends of the styluses to apply discrete impulses to the styluses to effect lengthwise movements thereof to cause their marking ends to make character-defining marks on impression-receiving material disposed between the platen and the marking ends of the line of styluses.

3. Apparatus according to Claim 2, wherein the stylus reciprocating means comprises a first guide element operable to move the marking ends of the styluses in a path determining one maximum dimension of characters, a

by the contacts the solenoid 6 is energised and imparts discrete impulses to the impulse-receiving end 4 of wire 1 causing the wire to be moved lengthwise to impinge against the transfer media web 9 so that, according to the length of a contact, a dot or a line is marked on the paper web 8. In Figs. 4 and 5 the reference numerals *27a*- - - - -*27cc* indicate the contacts and the dots or lines marked as a result thereof, the contact *28p* resulting in the marking of a line.

Although in the example given character-determining discs have been described as controlling the operation of solenoids 6 the manner of selection of the discs 28 for operation thereof forms no part of the present invention and is not illustrated in the drawings, it being understood that the electrical pulses to control operation of the solenoids 6 can, if desired, be obtained from sources other than discs 28.

On application of an electrical pulse to a solenoid 6, the armature 5 thereof, as mentioned above, effects lengthwise movement of the inner wire 1 so that the wire is impinged against the transfer media 9 and paper 8. It will be understood that the extent of lengthwise movement of the wire 1 is very short and after an impulse has been applied thereto the arrangement is such that the wires 30, Fig. 2, which connect the moving coil of the solenoid to terminals, not shown, act in conjunction with the tendency for wire 1 to straighten and the reactionary pressure exerted thereon by the impression-receiving material, which is under tension, to restore the wire 1 and armature 5 to the starting positions thereof.

The apparatus herein described is used in conjunction with a statistical machine controlled by records such as perforated record cards, or perforated tape, or by cards, tape other data-bearing media on which data is recorded by marks, for example marks having magnetic properties or light-absorbing properties, and from which the data is sensed to control the operations of the machine.

One form of statistical machine to which the apparatus may be applied is a tabulating machine, in which instance a stylus 1 may be controlled either directly as a result of the sensing of data from a record, or by a reading-out operation from an accumulator incorporated in the machine. The apparatus may, at some times, be controlled by records, and at other times by a reading-out operation from the accumulator.

Another form of statistical machine to which the apparatus can be applied is that form of statistical machine, known in the art as an interpreter, in which data sensed from a record is visually defined either on the record from which the data is sensed or on another record fed through the machine either in precedence to or succeeding the record from which the data is sensed.

In the embodiment of the invention described above the styluses have been described as flexible wires, but it will be understood that, if desired, a stylus can have a form other than that of a wire and may comprise a stylus which is provided with marking material so that it makes an impression by direct contact with the impression-receiving material, thus avoiding the necessity of the transfer media web 9 mentioned above. Thus the stylus may comprise a form of ball-point pen or it may be an element provided with a thin wick to which marking fluid is fed to effect the character-defining marks on the paper.

From the foregoing it will also be understood that during the definition of a character the paper 8 is stationary, the paper being fed as is customary to the individual line printing positions thereof between the printing of successive characters by the individual styluses and that, if desired, imprinting may be effected on sheets instead of on a web as hereinbefore described.

What we claim is:—

1. A method of defining characters on impression-receiving material, e.g. paper, consisting of the steps of positioning impression-receiving material for engagement by any one of a plurality of styluses, arranged in side by side relation for independent lengthwise movement determining the maximum height and maximum width of a character by moving the marking ends of all styluses simultaneously in two paths normal one to the other, and during said simultaneous movements applying discrete impulses to the styluses to effect lengthwise movements thereof to cause their marking ends to make character-defining marks in a single line on the impression-receiving material.

2. For defining characters on impression-receiving material, e.g. paper, apparatus comprising a platen, a plurality of styluses supported for independent movement lengthwise towards and away from the platen and in side by side relation in a line extending lengthwise of the platen, stylus reciprocating means operable simultaneously to move the marking ends of all styluses in two paths normal one to the other thereby to determine the maximum height and maximum width of a character, and actuating means operable during said simultaneous movements of the marking ends of the styluses to apply discrete impulses to the styluses to effect lengthwise movements thereof to cause their marking ends to make character-defining marks on impression-receiving material disposed between the platen and the marking ends of the line of styluses.

3. Apparatus according to Claim 2, wherein the stylus reciprocating means comprises a first guide element operable to move the marking ends of the styluses in a path determining one maximum dimension of characters, a

second guide element operable to move the marking ends of the styluses in a path normal to the path of said first guide element to determine the other maximum dimension of characters, and operating means to effect simultaneous operation of the first and second guide elements in a manner such that one said element is movable in its path a plurality of times during a single traverse in one direction by said other element.

4. Apparatus according to claim 3, wherein the first guide element is supported for reciprocation in a path determining the height of characters definable by the styluses and the second guide element engages the marking end of each of the styluses and is supported by the first guide element for movement therewith and for reciprocation relative thereto in a path normal to the path in which the first guide element is reciprocable thereby to determine the maximum width of characters definable by the styluses.

5. Apparatus according to Claim 4, wherein the operating means includes a pivoted cam-follower operatively connected with the first guide element, a cam co-operating with the cam-follower, a first continuously rotatable shaft supporting the cam for rotation therewith, an eccentric strap operatively connected with the second guide element, an eccentric co-operating with said strap, and a second shaft continuously rotatable in timed relation with said first shaft and supporting the eccentric for rotation therewith.

6. Apparatus according to Claim 5, wherein the first guide element is supported for reciprocation by said cam follower and guide posts co-operating with V-grooves formed in the first guide element adjacent the opposite ends thereof.

7. Apparatus according to any of the preceding Claims 2 to 6, wherein each stylus consists of a flexible outer member supported by the opposite ends thereof and an inner wire extending therethrough to project beyond the opposite ends thereof and have an impulse-receiving end for co-operation with the actuating means and a marking end to make character-defining marks on impression receiving material.

8. Apparatus according to any of the preceding Claims 2 to 7, wherein the actuating means for each stylus comprises a moving coil solenoid including a movable armature to apply said discrete impulses.

9. Apparatus according to Claim 2, substantially as herein described and with reference to the drawings accompanying the Provisional Specification.

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PROVISIONAL SPECIFICATION

An improved method of and apparatus for Defining Characters on Impression-Receiving Material

We, POWERS - SAMAS ACCOUNTING MACHINES LIMITED, a Company incorporated under the laws of Great Britain, of Powers-Samas House, Holborn Bars, London, E.C.1, (England), do hereby declare this invention to be described in the following statement:—

This invention relates to an improved method of and apparatus for defining characters on impression-receiving material.

It is a main object of the invention to provide a method of and apparatus for automatically effecting the definition of characters on impression-receiving material, e.g. paper, at a relatively high speed and in carrying the invention into effect one or more styluses is or are employed, each stylus being capable of defining any one of a predetermined number of characters. By a "relatively high speed" is to be understood the capacity of a stylus or of each stylus to define characters at a rate of 150 or more characters per minute.

According to the present invention there is provided a method of defining characters on impression-receiving material, e.g. paper, consisting of the steps of determining the maximum height and maximum width of a character by moving the marking end of a stylus simultaneously in two paths normal one to the other, and during said simultaneous movements applying discrete impulses to the stylus to effect lengthwise movements thereof to cause its marking end to make character-defining marks on the impression-receiving material.

Further according to the invention there is provided for defining characters on impression-receiving material, e.g. paper, apparatus comprising a platen, at least one stylus the marking end of which is supported for movement lengthwise towards and away from the platen, stylus reciprocating means operable simultaneously to move the marking end of the stylus in two paths normal one to the other thereby to determine the maximum height and maximum width of a character, and actuating means operable during said simultaneous movement of the marking end of the stylus to apply discrete impulses to the stylus to effect lengthwise movements thereof to cause its marking end to make character-defining marks on the impression-receiving material.

Still further according to the present invention there is provided for defining characters on impression-receiving material, e.g. paper, apparatus comprising a platen, at least one stylus the marking end of which is supported for movement lengthwise towards and away from the platen, a first stylus reciprocating element operable to move the marking end of the stylus in a path determining one maximum dimension of a character, a second stylus reciprocating element operable to move the marking end of the stylus in a path normal to the path of said first element to determine the other maximum dimension of a character, operating means to effect simultaneous operation of said first and second elements in a manner such that one said element is movable in its path a plurality of times during a single traverse in one direction by said other element, and actuating means operable during said simultaneous movements of the marking end of the stylus to apply discrete impulses to the stylus to effect lengthwise movements thereof to cause its marking end to make character-defining marks on the impression-receiving material.

The stylus may comprise a flexible wire having the end thereof opposite its marking end constrained against movement other than lengthwise and its marking end supported by guide elements moving simultaneously in predetermined paths normal one to the other. The first of said guide elements may be supported by posts for sliding movement lengthwise of the posts and the second guide element supported by the first element for sliding movement lengthwise of the first guide element operating means being connected with each said guide element to effect said simultaneous movements thereof.

In one embodiment of the invention a stylus may be formed by the inner wire of a flexible cable comprising a fixed outer member and an inner wire movable lengthwise relative thereto.

In order that the invention may be clearly understood one embodiment thereof will now be described, by way of example, with reference to the accompanying diagrammatic drawings in which:—

Fig. 1 pictorially illustrates one form of apparatus for defining characters in accordance with the invention,

Fig. 2 is an elevation partly in section and illustrates means for effecting lengthwise movements of styluses,

Fig. 3 is a pictorial view, on line III—III, Fig. 1, illustrating the manner in which a character is defined in accordance with the invention,

Fig. 4 illustrates a character disc for the letter "A," and

Fig. 5 graphically illustrates the manner in which, under control of the disc shown in Fig. 4, a stylus defines the letter "A" on impression receiving material.

Referring to the drawings, the apparatus diagrammatically illustrated therein embodies a plurality of styluses each of which consists of a flexible wire 1, the wire 1 being the inner wire of a flexible cable such as a Bowden wire which cable consists of the inner wire 1 and an outer member 2 which outer member is a fixed member having its opposite ends clamped as indicated in Figs. 1 and 2. The inner wire 1 is movable lengthwise relative to the outer member 2 and the end 3, Fig. 3, thereof is the marking end while the opposite end 4, Fig. 2, of the wire is connected to the armature 5 of a moving coil solenoid 6 so that the wire 1 is movable lengthwise but the end 4 thereof is constrained against movement other than lengthwise movement.

The marking ends 3 of the flexible wires 1 are directed towards a platen 7, Figs. 2 and 3, over which, in any suitable known manner, there is fed a web 8 of impression-receiving material such as paper the feeding apparatus for which, as is customary, is arranged to feed the paper to successive line positions thereof, the paper being stationary during character-defining operations. Also over the platen 7 is fed a web 9 of transfer media such as a carbon ribbon or the like.

The marking ends 3 of the wires are supported by a first reciprocating guide element 10 and a second reciprocating guide element 11, the wires passing through apertures 12 in the guide elements. The first guide element 10 is, at the opposite ends thereof, provided with V-grooves each of which embraces a post 13, Fig. 1, so that the guide element 10 is slidable lengthwise of the posts. A pin 14 extends from each end of the first guide element 10 and is engaged in a slot 15 formed in a bell-crank lever 16 supported on a pivot 17. The bell-crank lever 16 carries a cam follower 18 which is urged towards a cam 19 by a spring 20. The cam 19 is rotatable with a shaft 21 which is rotated in any suitable manner from the main drive of the machine, not shown.

The second guide element 11 has a tongue 22 extending lengthwise thereof, the tongue being housed in a groove extending lengthwise of the first guide element 10 so that the second guide element 11 is carried by the first guide element 10 and is supported for sliding movement lengthwise thereof and in a direction normal to the direction of movement of the first guide 10, as indicated by the double-headed arrows 23 and 24, Figs. 1 and 3. To one end of the second guide element 11 is connected an eccentric strap 25, Fig. 1, the strap 25 co-operating with an eccentric 26 rotated by a shaft 27, also driven by any suitable means, not shown, from the main drive of the machine. The shafts 21 and 27 are rotated simultaneously and in synchronism

in order that the movements of guide elements 10 and 11 in directions 23, 24 are effected simultaneously so that the guide elements move the marking ends of the styluses 1 simultaneously in two paths, normal one to the other, as determined by the cam 19 and eccentric 26. The arrangement is such that the reciprocating movements 23 of the first guide element 10 determine the maximum height of a character to be defined by a stylus 1 while the reciprocating movements 24 of the second guide element 11 determine the maximum width of the character.

The cam 19 and eccentric 26 are so timed that while the cam 19 is causing the guide element 10 to make a single traverse in one direction the eccentric 26 causes the guide element 11 to make a plurality of reciprocations 24. In the embodiment of the apparatus herein described it is assumed that while the guide element 10 makes one reciprocation 23 the guide element 11 makes eleven reciprocations 24. However, as can be seen from Fig. 5, the arrangement is such that discrete impulses are applied to the wires 1 only during the first eight of a cycle of eleven reciprocations 24, the remaining three reciprocations of the cycle being idle and representing the interval during which selection is made from a plurality of continuously rotating character discs, of which one 28 is illustrated in Fig. 4, to control the operation of solenoids 6. It will be understood that the ratio of 1:11 is given by way of example only and that other ratios can be employed to suit the nature of the work to be done.

As viewed in the drawings, the guide element 10 is making its downward stroke during character definition and at the end of its downward stroke which is a steady movement from top to bottom, as viewed in Fig. 5, the roller 18 drops from the peak of the cam down a step 29 formed thereon so that the return movement is a very quick movement. The quick return movement of guide element 10 is necessitated by the fact that it must be completed during the line-feeding operation of paper 8.

Each character disc 28 is electrically connected with each solenoid 6 and is provided with peripheral electrical contacts *27a*-----*27cc* for co-operation with brushes, not shown, so that at intervals and for periods determined by the contacts the solenoid 6 is energised and imparts discrete impulses to wire 1 causing the wire to be moved lengthwise to impinge against the transfer media 9 so that, according to the length of a contact, a dot or a line is marked on the paper web 8. In Figs. 4 and 5 the reference numerals *27a*-----*27cc* indicate the contacts and the dots or lines marked as a result thereof, the contact *27p* resulting in the marking of a line.

Although in the example given character-determining discs have been described as controlling the operation of solenoids 6 the manner of selection of the discs 28 for operation thereof forms no part of the present invention and is not illustrated in the drawings, it being understood that the electrical pulses to control operation of the solenoids 6 can, if desired, be obtained from sources other than discs 28.

On application of an electrical pulse to a solenoid 6, the armature 5 thereof, as mentioned above, effects lengthwise movement of the inner wire 1 so that the wire is impinged against the transfer media 9 and paper 8 and when the electrical pulse ceases the wire 1 is restored to the inactive position thereof on return movement of the armature 5.

It will be understood that, if desired, a single stylus 1 may be employed to effect the definition of characters on impression receiving material such as tape, but in the preferred embodiment of the invention the apparatus comprises a plurality of wires 1, as illustrated in Figs. 1 and 3, the apparatus being used in conjunction with a statistical machine controlled by records such as perforated record cards, or perforated tape, or by cards, tape or other data-bearing media on which data is recorded by marks, for example marks having magnetic properties or light-absorbing properties, and from which the data is sensed to control the operations of the machine.

One form of statistical machine to which the apparatus may be applied is a tabulating machine, in which instance the stylus 1 may be controlled either directly as a result of the sensing of data from a record, or by a reading-out operation from an accumulator incorporated in the machine. The apparatus may, at some times, be controlled by records, and at other times by a reading-out operation from the accumulator.

Another form of statistical machine to which the apparatus can be applied is that form of statistical machine, known in the art as an interpreter, in which data sensed from a record is visually defined either on the record from which the data is sensed or on another record fed through the machine either in precedence to or succeeding the record from which the data is sensed.

In the embodiment of the invention described above, the styluses have been described as flexible wires, but it will be understood that, if desired, a stylus can have a form other than that of a wire and may comprise a stylus which is provided with marking material so that it makes an impression by direct contact with the impression-receiving material, thus avoiding the necessity of the transfer media 9 mentioned above. Thus the stylus may comprise a form of ball-point pen or it may be an element provided with a thin wick to which marking fluid is fed to effect the character-defining marks on the paper.

From the foregoing it will also be under-

stood that during the definition of a character the paper 8 is stationary, the paper being fed as is customary to the individual line printing positions thereof between the printing of successive characters by the individual styluses.

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