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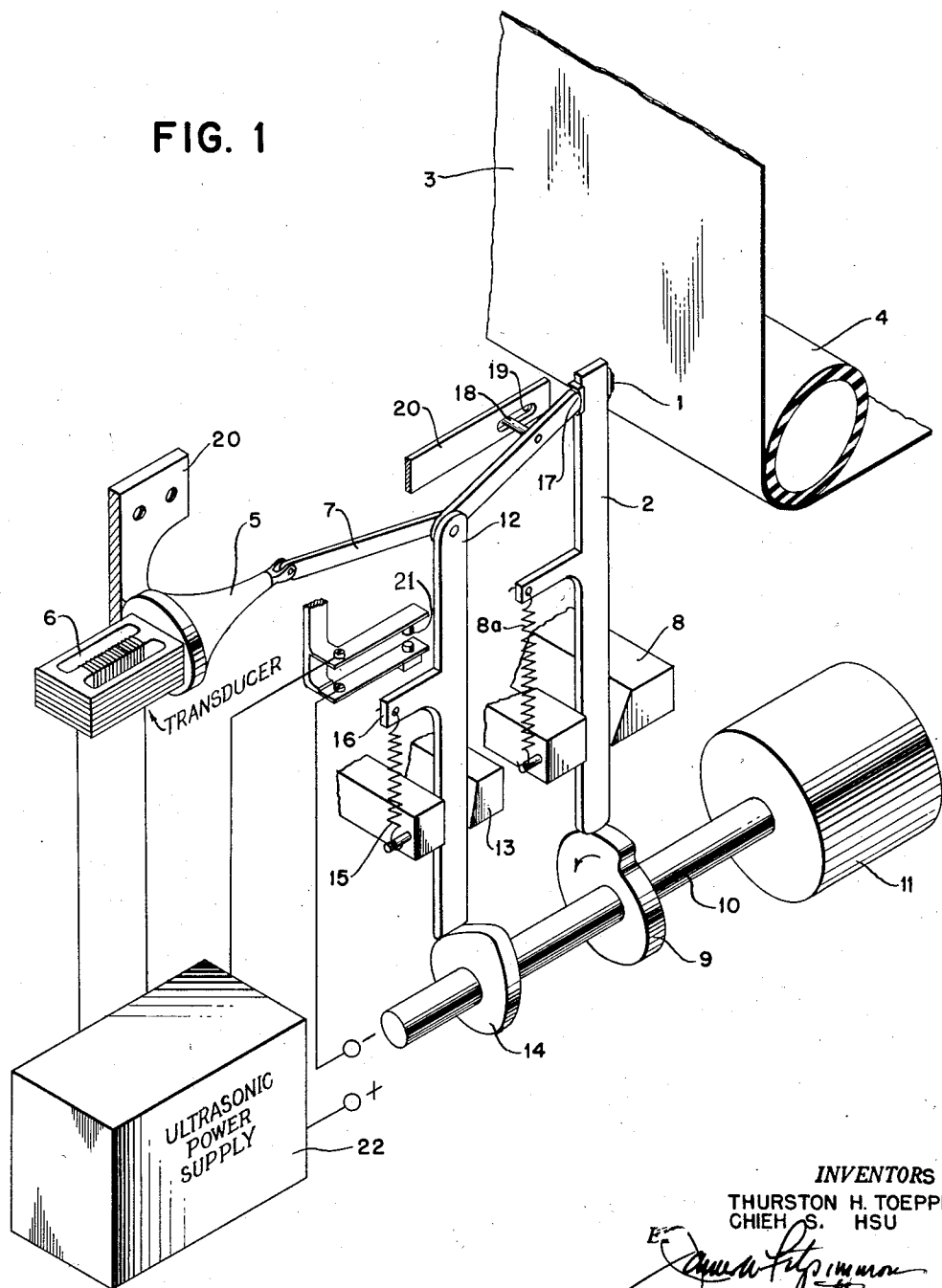
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2,792,779

VIBRATING PRINTING MEANS

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FIG. 1



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VIBRATING PRINTING MEANS

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3 Claims. (Cl. 101—93)

This invention relates to a new method of printing and more particularly, to an improved high frequency, noiseless printing process.

It has been noted that low velocity typewriter pressure printing is much less effective in producing carbon copies than high velocity impact printing even though the peak pressure might be identical for each form. Presumably, the shock waves resulting from the high velocity impact aids in transferring the carbon vehicle in a stack to the next succeeding printing page. On the other hand, the noise from impact printing is at a much higher level than that of pressure printing, and accordingly impact printing is not the complete solution to multiple copy work.

As a means of combining the advantages of the low noise level associated with pressure printing, and the improved carbon copy production of the impact type, it is an object of this invention to provide a new printing method, wherein an ultrasonic transducer is attached to a pressure printing mechanism, to vibrate the latter at very high frequencies. It has been found that the added vibration thus applied to a type bar will improve the carbon transfer regardless of its velocity or force of impact.

It is a further object of this invention to provide an improved high frequency printing mechanism.

It is a still further object of this invention to provide an improved noiseless printing mechanism.

It is a still further object of this invention to provide an improved printing process whereby type characters may be reproduced on heat sensitive paper.

Other objects and advantages of this invention will be pointed out in the following description and claims, and illustrated in the accompanying drawing, which discloses by way of example, the principle of the invention and the best mode, which has been contemplated, of applying that principle.

Briefly, this invention relates to a new printing method comprising the steps of positioning a type bar in print position, applying a moderate pressure to the type bar against a printing sheet, and the vibrating of the type bar at a very high frequency.

Referring to the drawing, the single figure is a schematic view of the apparatus required for this improved printing process.

The improved printing apparatus is shown as comprising a type face 1 mounted on a type bar 2, a paper stack 3, a platen 4, a cone 5, electrical vibrating means 6 for vibrating cone 5, an articulated linkage 7 interpositioned between the tip of the cone 5 and the type bar 2, and means for lifting a type bar into printing position and for straightening out the articulated linkage 7 thereby to apply a pressure between the cone 5 and the type bar 2.

The type face 1 may be of any conventional shape such as, for example, one of those commonly used on a type bar in a standard typewriter. By mounting the type face 1 on a suitable type bar 2, the latter may be raised in a guide 8 and against the force of spring 8a by means of a cam 9 mounted on shaft 10 driven by some motor source

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11 so that the type face is lifted into printing position adjacent the platen 4.

After the type face 1 is brought into printing position, it is necessary to apply a pressure (e. g. 10 to 15 pounds) to the type bar and then set it into vibration. In order to accomplish this objective, the articulated linkage 7, which is supported at one end by cone 5, is mounted for movement into and out of a straight line position by a rod 12 mounted in suitable guide blocks 13 for vertical movement in response to the rotation of cam 14. The latter is also mounted on shaft 10, and, therefore, driven by motor 11. It will be noted that a suitable spring 15 is interconnected between block 13 and an arm 16 on the rod 12 thereby holding rod 12 normally in its lower position so that no pressure is applied between the cone 5 and the type bar 2. As the lift portion of cam 14 moves under the rod 12, it lifts the latter to straighten out the linkage 7 thereby exerting a pressure between the cone 5 and the type bar 2. It will be noted that in moving from its retracted to its extended position, the outer end 17 of the articulated linkage 7 is guided by a pin 18 which slides in a slot 19 carried by a support bracket 20 which also holds the cone 5. With this arrangement of parts, it is obvious that the outer or operating end 17 of the articulated linkage 7 is moved into contact with the type bar 2 and that pressure is applied to the linkage 7 when rod 12 is raised to its highest position in response to the rotation of cam 14.

It should be noted that the arm 16 on rod 12 is positioned to close a set of electrical contacts 21 which are schematically indicated as closing a circuit in an ultrasonic power supply 22 for the transducer 6. Since the latter is only schematically indicated, it should be pointed out that any commercial transducer operating in the ultrasonic frequency range will be satisfactory to meet the requirements of this invention. In one embodiment, a magnetostrictive transducer rated at 24.3 kilocycles and 200 watts was found to produce desirable results. Actually, a high magnetic flux frequency oscillator is set up in the transducer causing the cone 5 to be vibrated axially at a very high rate. By keeping the vibration frequency above the sonic range, the noise level, of course, will be of a minimum.

Operation

In the operation of this mechanism, as illustrated in the accompanying drawing, the motor 11 through the rotation of shaft 10 causes cam 9 to lift the type bar 2 through the guide 8 and into printing position. Shortly thereafter, the cam 14 also driven by a shaft 10, but having its lobe timed behind that of cam 9, causes the rod 12 to be raised thus, straightening out the articulated linkage 7 so that a pressure is applied between the end of cone 5 and the type bar 2. It will be noted that as the rod 12 is raised, the shoulder 16 attached thereto, closes the contacts 21 to effect the closing of an electrical circuit thereby setting up a high frequency oscillation in the transducer 6, which sets up a mechanical vibration at an ultrasonic frequency in cone 5 that is carried through the articulated linkage 7 (now straightened and under pressure) from the tip of cone 5 to the type bar 2. It has been found that with the equipment thus described that the ultrasonic vibration, when turned on even for a few milliseconds, makes it possible to produce good carbon copies with a minimum noise level.

It should be further noted, that the high frequency produced by the transducer 6 and transferred to type face 1 created heat in the paper stack tending to melt the wax vehicle used in carbon paper, thus permitting the carbon to be transferred substantially in a liquid state to succeeding printing pages. The heat produced by this ultrasonic vibration is also sufficient to permit printing

on a heat sensitive paper. That is, the heat generated by the vibration will produce an image of the type face on heat sensitive paper.

It is obvious that while the apparatus illustrated embodies only the bare scope of the invention, that the new printing process, which has been described and schematically shown, may easily be incorporated in typewriters and other printing devices to provide an improved noiseless multi-copy printing process.

Since the apparatus was shown schematically, it should be pointed out that the bearings in the articulated linkage 7 must be very tight having clearance in the order of $\frac{1}{10,000}$ ". A tight fit is required since the amplitude of vibration in the cone 5 may be only in the order of $\frac{1}{1,000}$ ", and slack in the bearings would prevent this motion being translated to the type bar. It should also be pointed out that any problem of a tight linkage may be avoided by employing the transducer integrally with an anvil which would be located behind the work sheet to act as a platen.

While there have been shown and described and pointed out the fundamental novel features of the invention as applied to a preferred embodiment, it will be understood that various omissions and substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art without departing from the spirit of the invention. It is the intention, therefore, to be limited only as indicated by the scope of the following claims.

What is claimed is:

1. An improved printing apparatus comprising means positioning a work sheet for a printing operation, a type bar having a type element thereon, means moving said type bar into printing relation with said work sheet, a cone, means including a transducer for setting up high frequency vibrations in said cone, an articulated linkage interconnecting said cone and said type bar when the latter is in printing relation with said work sheet, means acting on said articulated linkage for applying a pressure between said cone and said type bar, and an electrical circuit energized in response to said last means for oper-

ating said transducer to set up mechanical vibrations in said cone and through said articulated linkage to said type bar.

2. An improved printing apparatus comprising, in combination, means positioning a work sheet for a printing operation, a print element, means for moving said print element, means for moving said print element into a position adjacent said work sheet, a device operative when energized for producing a vibrating action, means operatively connecting said device to said print element, said last mentioned means being movable for forcing said print element against said work sheet from a position adjacent the latter, means including a pair of switch contacts for controlling the energizing of said device, and means for moving said connecting means and simultaneously closing said switch contacts.

3. An improved printing apparatus comprising, in combination, a platen supporting a work sheet for a printing operation, a print element, means for moving said print element into a position adjacent said work sheet, a device operative when energized for producing a vibrating action, an articulated linkage connecting said device to said print element, said linkage being actuatable for forcing said print element against said work sheet from a position adjacent the latter and providing a rigid connection to said device, means including a pair of switch contacts for controlling the energizing of said device, and means for actuating said linkage and simultaneously closing said switch contacts.

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