

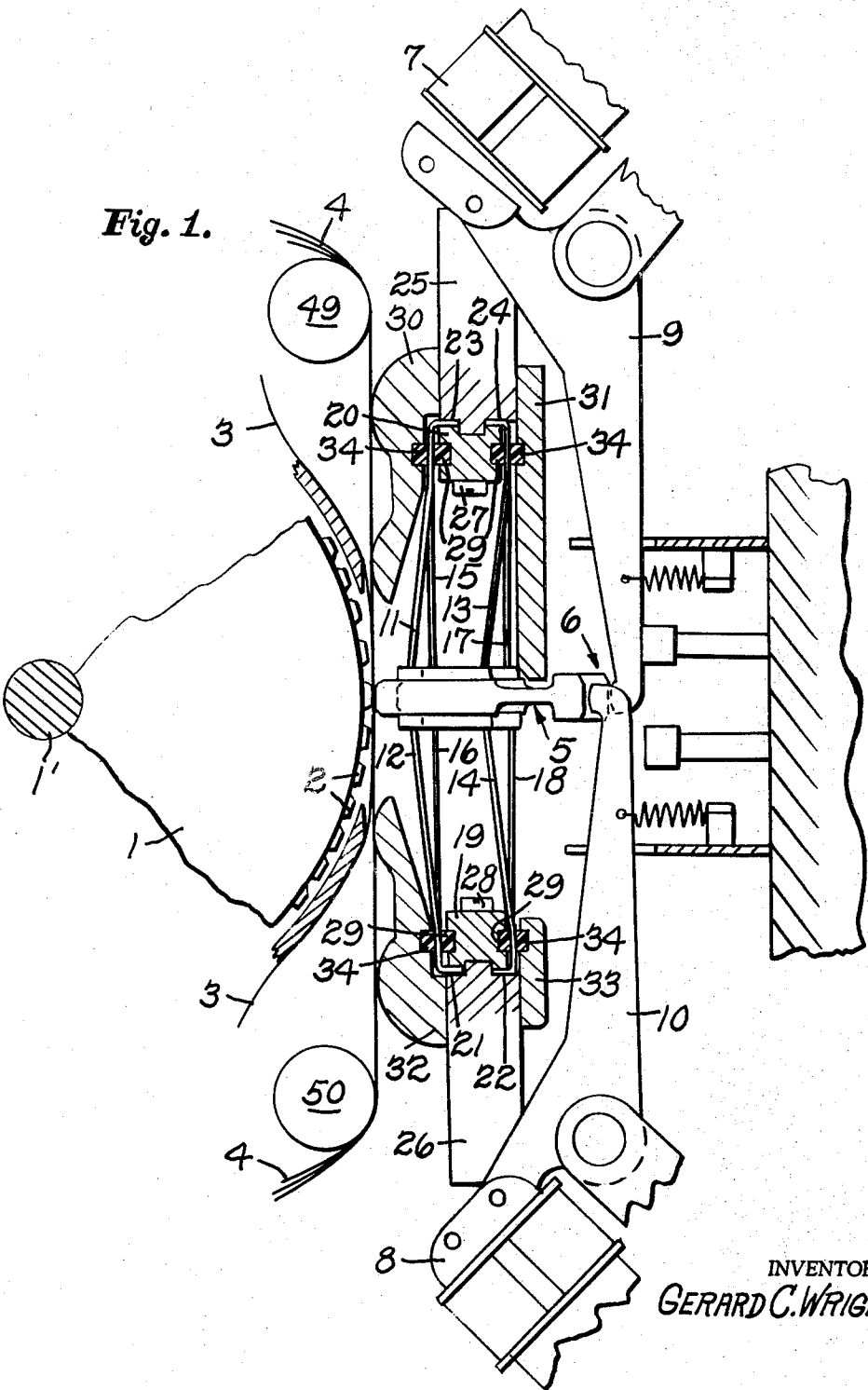
Aug. 25, 1964

G. C. WRIGHT
RECORDING APPARATUS

3,145,650

Filed Dec. 3, 1962

4 Sheets-Sheet 1



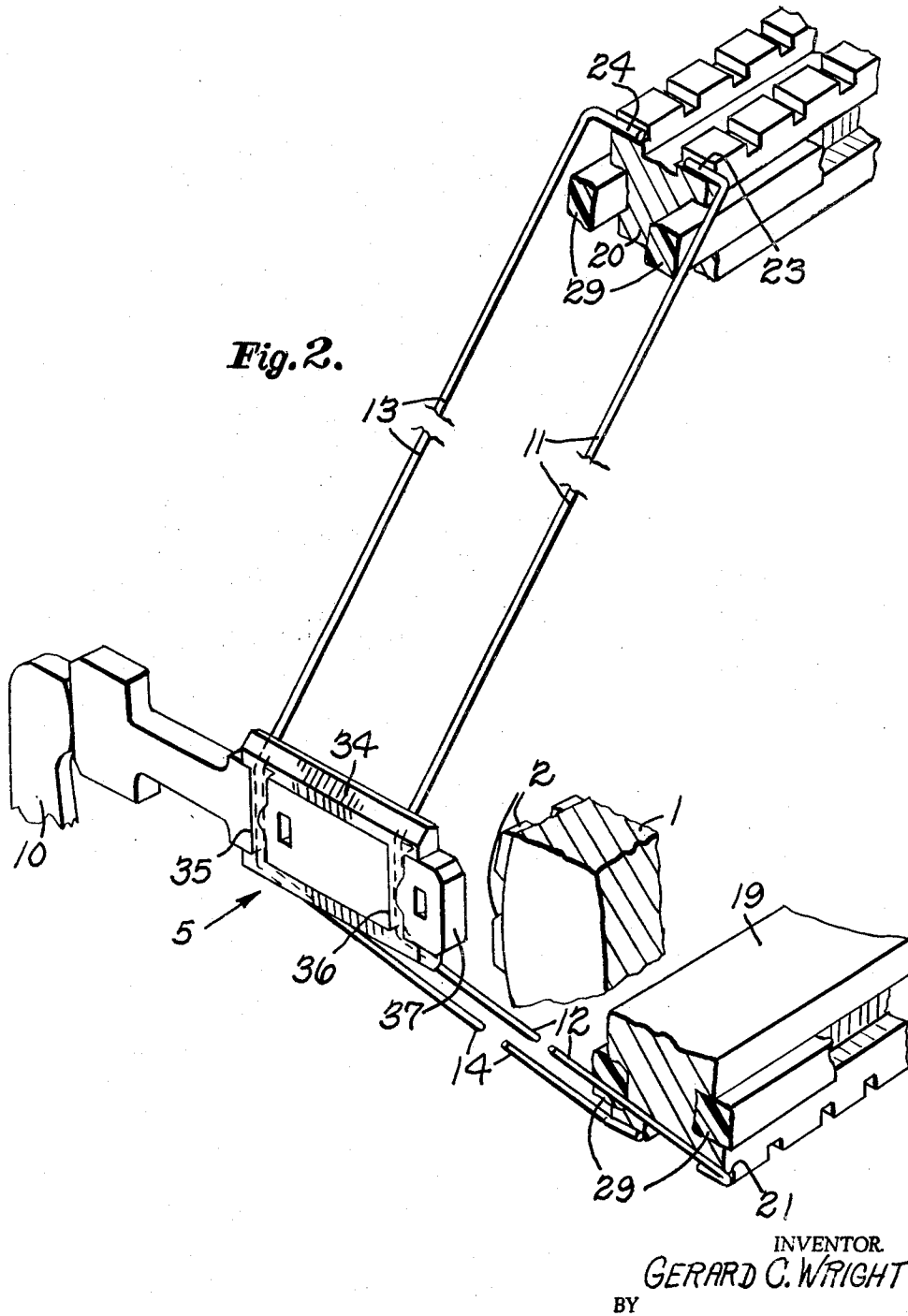
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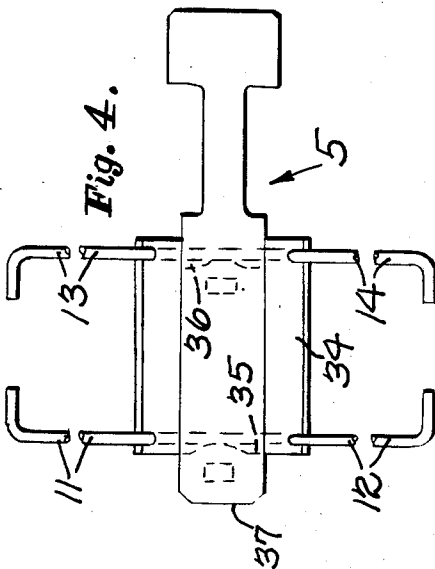
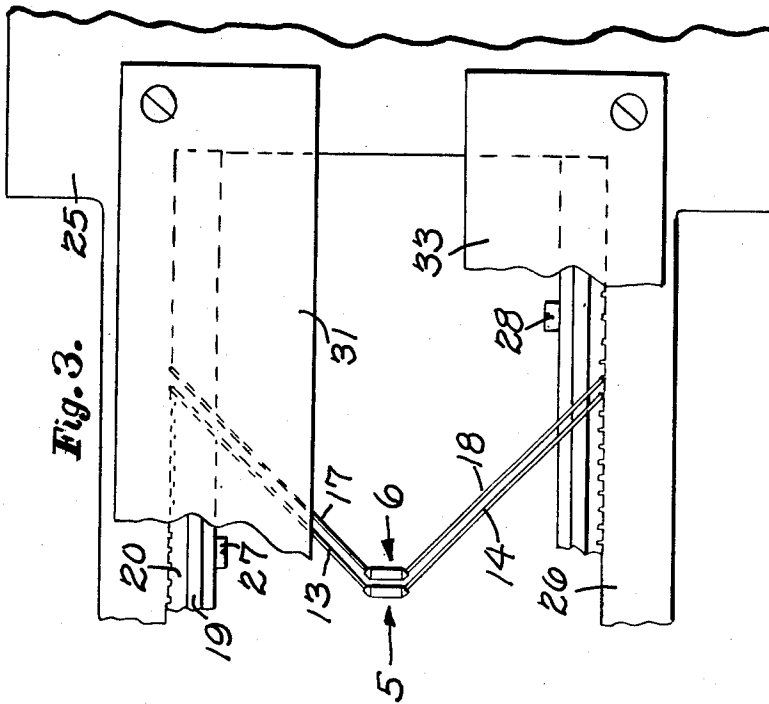
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4 Sheets-Sheet 3



INVENTOR.
GERARD C. WRIGHT
BY

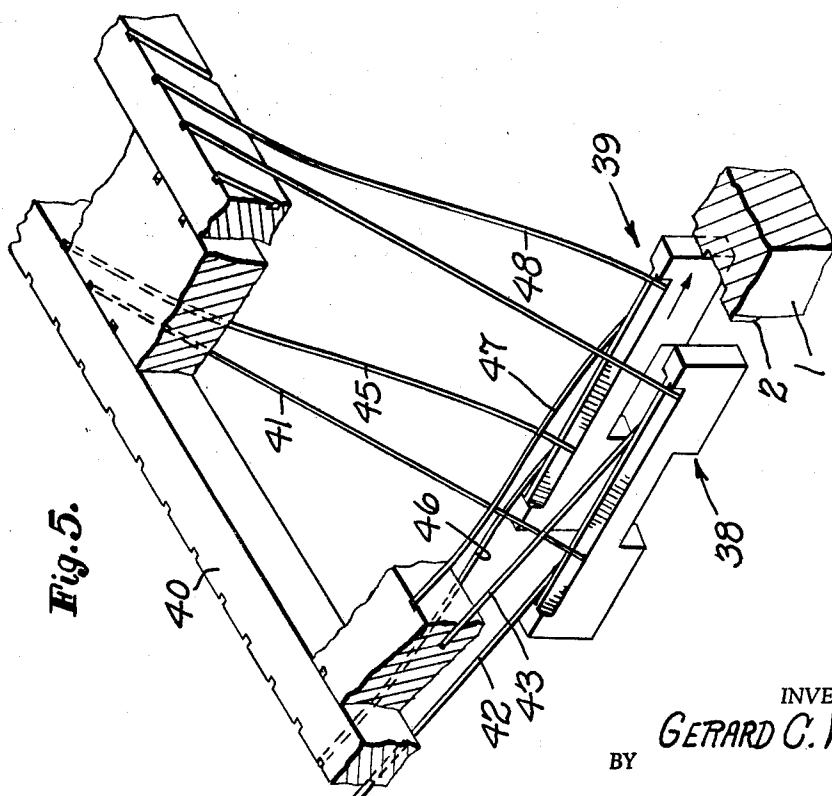
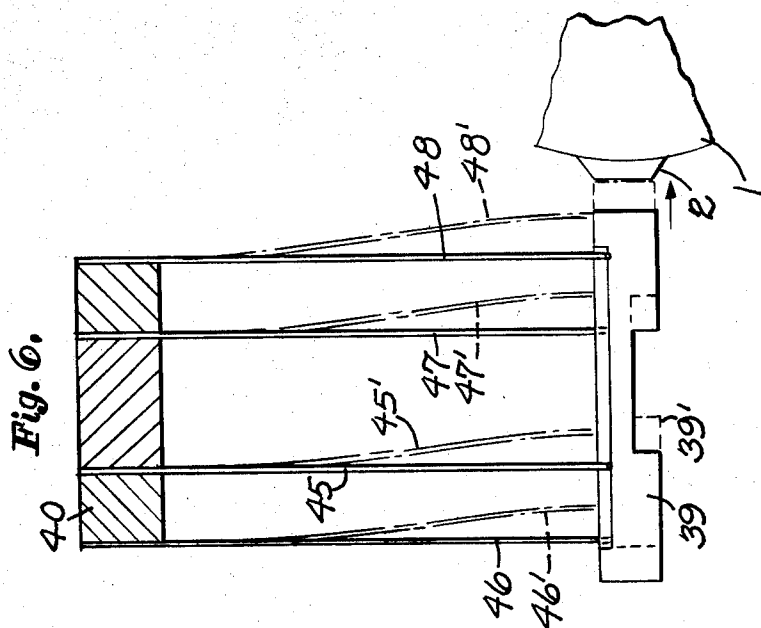
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4 Sheets-Sheet 4



INVENTOR.
GERARD C. WRIGHT
BY

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RECORDING APPARATUS

Gerard C. Wright, Grosse Pointe, Mich., assignor to Burroughs Corporation, Detroit, Mich., a corporation of Michigan

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4 Claims. (Cl. 101—93)

This invention relates generally to recording apparatus and particularly to recording or printing apparatus utilizing movable elements, or interposers, for effecting recording or printing strokes. The invention is hereinafter described with respect to a drum-type on-the-fly printer.

In a drum-type on-the-fly printing device, a drum carries type in lines extending along its periphery parallel to its longitudinal axis. Each longitudinally extending line carries the same type character, there being as many different type characters which may be employed with the printer. As the drum rotates, successive ones of the above mentioned longitudinal lines come into the position in the device in which they are to print or otherwise used to mark or record upon a record medium, such as a manifold assembly of an original and several copy sheets. The record medium is pressed against the type face by means of an actuator mechanism. Since it is often necessary or desirable to vary the numbers of copies printed, or to vary the thickness of paper or carbon, the paper, preferably, is not struck directly by the actuator as the actuator would have to be adjusted for each thickness to allow the actuator armature to bottom. Therefore, for each printing element an interposer is preferably placed between the actuator mechanism and the paper so that the armature can bottom before the interposer strikes, thus keeping efficiency higher than if adjustments were required to enable the armature to bottom for varying paper thicknesses.

The interposer must be guided in its flight to insure that it will strike the rotating drum at precisely the correct place on the drum periphery. Also, the interposer must be returned to its actuator in correct position for the next print cycle.

It has been customary to mount each interposer in a supporting channel or guide so that upon the impact of the actuating mechanism, the interposer moves forward to effect a printing stroke. Upon the completion of this stroke, the interposer returns to its original or non-actuated position within the guide by a spring means. Due, however, to varying frictional forces, dust, or lint within the guides, the flight of the interposer, either in its forward motion toward the drum or in its spring actuated motion back to the non-printing position, is often erratic. This erratic motion might allow the character drum to turn to a slightly different and incorrect printing position before being struck by the interposer which in turn may cause the line of printed characters to vary considerably from a straight line. Further, the removal of dust and lint from the interiors of the channels is a time consuming and expensive procedure. Also, the channels require very accurate machining during their manufacture to insure proper fit between them and the interposers.

It is a primary object of this invention to provide an improved recording or printing apparatus having an interposer mechanism which will not be erratic in its motion either during the printing stroke or during its return to the non-printing position.

Another object is to provide recording or printing apparatus which eliminates guides or channels for mounting the interposers and the accompanying problem of friction between the internal surfaces of the guides and the interposers.

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Another object is to provide an interposer mounting means which is simpler and cheaper to manufacture than the customary guides or channels.

In carrying out the objects above, the interposers are carried only by a set of spring wire mounts which flex to enable the interposer to move toward the type drum, effect a printing stroke, and subsequently return to their original or non-printing positions. Since these mounts are the only means for carrying the interposers, there is no frictional engagement between the interposer and any other member during its motion, and erratic behavior due to friction or dust may be eliminated. According to the present invention, it has been found that remarkably improved results are obtained when the mounts for the interposers comprise a first plurality of wire mounts affixed to the interposer and a second plurality of wire mounts also affixed to the interposer, the plane formed by the first plurality of mounts intersecting the plane formed by the second plurality of mounts, the line formed by the intersecting plane being parallel to the longitudinal axis of said element.

Other features of the invention will appear in the description of the invention below with reference to the accompanying drawings in which:

FIG. 1 is a view, partly in section illustrating the relative relation of the printing drum, interposers, actuating mechanism, mounting means for the interposers, etc., in a drum-type printing device constructed in accordance with the invention;

FIG. 2 is a perspective view of one interposer and its mounting means as well as the support structure for the mounting means in the system of FIG. 1;

FIG. 3 is a front elevation of several of the interposers of FIG. 2 mounted in a support;

FIG. 4 is a side elevation of an interposer of FIG. 1;

FIG. 5 is a perspective view of another embodiment of the invention; and

FIG. 6 is a side elevation of the embodiment of the invention which is shown in FIG. 5.

Referring now to FIG. 1, there is shown a high speed printer of the type described above and in which the present invention finds use. The printer comprises a drum 1 having lines of type 2 extending along the face of the drum. Shaft 1' driven from a motor (not shown) rotates the drum at the proper speed. A ribbon 3 supplies ink so that papers 4 may be printed upon. Carbon paper or ribbon (not shown) may be interposed between the rolls of paper 4, or copies can be produced by using one of the available copy papers which does not require carbon paper or ink ribbon. Means, such as 49 and 50, are provided in order to advance the layers of paper as successive lines are printed. Of course, other means such as a pin feed mechanism may be used. Two interposers 5 and 6 are shown, one (5) being in the fired or printing position and the other (6) being in the normal or non-printing position. It is understood, that within the scope of this invention the row of adjacent interposers would consist of as many as there are type characters in a line. This is made clear in FIGS. 2 and 3 which illustrate support structure for a plurality of interposers and their mounting means. One commercial form of printer has a 120-character printing line, and therefore there would be 120 interposers in this unit.

For each interposer there is an actuating mechanism comprising a solenoid and an armature; solenoid 8 and armature 10 being used to fire interposer 5, while solenoid 7 and armature 9 are used to fire interposer 6. Means other than a solenoid, such as a cam mechanism, may obviously be used to actuate the armature of the device. The system further includes a sensing means (not illustrated) that indicates when a character is in position to print, which may be a photoelectric or any other suit-

able means. This sensing means controls the timing of the pulses which energize the individual solenoids which are to be energized when any particular line of type is in position to print. When an interposer is fired, the armatures carry the interposers forward a portion of the distance which they will travel to effect printing. The momentum generated by the movement of the armature carries the interposer the remainder of the travel distance and enables the interposer to press the paper against the drum. It may be desirable to bias the wire mounts slightly towards the armature or actuating element so that the interposer in its rest position actually contacts the armature. This slight biasing serves to compensate for errors or tolerances in the manufacture of the parts so that the interposer does not oscillate upon its return from the printing position. If the parts were not properly manufactured, there might be a space between the armature face and the interposer and such a mechanical oscillation might occur.

Each interposer is carried by four mounting means, the mounting means consisting of round wires, made of a suitable material such as steel, which possesses the required mechanical properties such as strength and flexibility. In FIG. 1, wire elements 11, 12, 13, and 14 carry interposer 5 while wire elements 15, 16, 17, and 18 carry interposer 6. The mounting means for each interposer may comprise four wires each having an end terminating on the interposer. Another mounting structure, which will be disclosed in detail in connection with the figures, comprises only two wires for each interposer, the two wires forming four wire mounts. The wire mounts are supported at their ends by two support structures 19 and 20.

FIG. 1 illustrates the manner in which the wire mounts are rigidly contained by the support structures 19 and 20. The ends of the wires are bent near their ends and inserted into rectangularly shaped grooves 21-24. Plates 25 and 26 are clamped against the grooved surfaces of supports 19 and 20 respectively by bolts, such as 27 and 28, to firmly contain the wire ends. Because of the bending of the wires where they are inserted into the grooves, removal of the wires by pulling is made difficult because this would require the wires to be straightened in order to be removed. Longitudinally extending plastic strips 29 are inserted into grooves in supports 19 and 20 so that the wire mounts do not rub directly against the supports. Plates 30-33, each containing a plastic strip 34 longitudinally coincident with plastic strips 29, are secured against supports 19 and 20 to insure that the wire mounts do not move within their grooves 21-24. Further, the wire mounts cannot directly contact plates 30-33 because of strips 34. The coincident plastic strips thus eliminate metal fatigue occurring because of the mounts rubbing against another metal portion of the device.

Referring now to FIG. 2, the mounting of an individual interposer can be clearly seen. It is to be particularly noticed in this figure that mounting means 11 and 13 form a plane and that mounting means 12 and 14 form another plane. It is seen that the four mounting means for the interposer shown in FIG. 2 comprise two wires being bent in the region of their midpoints and having the interposer affixed thereto in the region of these bend portions.

FIG. 3 shows a plurality of interposers mounted in the support members 19 and 20 in accordance with the description of FIG. 1. Only two wire mounts are shown affixed to the interposers 5 and 6 in this view, the other two wire mounts being hidden by the two which are shown. It can be seen that any desired number of interposers may be mounted upon the supports, the grooves for the additional non-illustrated interposers being shown in this view and in FIG. 2. Referring back to discussion of FIG. 2, the angle of intersection the planes formed by the wire mounts can be seen. In FIG. 3 this angle

of intersection is seen to be approximately 90° although, as will subsequently be made clear, this angle of intersection may be widely varied and still operate within the scope of the invention.

As is evident from the several views of the invention described above, it is seen that the interposers are in a linear array and that any particular interposer or interposers may be fired while one column of characters on the drum is in printing position. At least four wire mounts are required for each interposer to insure that the interposer is held in a position in which its longitudinal axis is parallel to the line of intersection formed by the planes in which the wire mounts lie. If only two wire mounts were affixed to each interposer, the interposer might pivot about the two affixed mounts when struck by an armature rather than move forward toward the type drum. This pivoting motion might cause the face 37 of the interposer as shown in FIG. 2 to strike the type face in different positions during different strokes. More than four wire mounts may be used to support each interposer but a minimum of four wire mounts per interposer is required.

It is obvious from the various figures of the drawings that the movement of each interposer is slightly arcuate because the mounts are secured to their respective supports at a point which is displaced along the longitudinal axis of the supports from the point at which the mounts are secured to the interposer. However, because of the four mounts affixed to each interposer, the path traversed is identical each time the individual interposer is actuated and the slightly curved path is taken into account in the design of the device.

The movement of the interposer toward the drum, as has already been discussed, results from the interposer being carried along part of its path by the actuating means and partly by the momentum acquired during this carried portion of the path. The forward movement toward the drum flexes the wire mounts but these wires do not move within their grooves in supports 19 and 20. Upon striking the paper the interposer is returned to its normal position partly by its bouncing away from the resilient paper and partly by the return of the wire mounts to their unflexed position. The angle formed by the planes in which the wire mounts lie determines in part the degree of rigidity which each interposer possesses. As seen most clearly in FIG. 3 where the angle of intersection of the two planes is approximately 90°, the rigidity of the interposer and the mounting means is a maximum. For example, any tendency of wire portion 17 to sway to or from support 20 would be opposed by wire portion 18. If wire portion 17 were forced toward support 20, this movement would require portion 18 to be stretched directly along its longitudinal axis. If wire portion 17 were forced away from support 20 toward support 19, such a movement would require portion 18 to be compressed directly along its longitudinal axis. Obviously, any similar tendency of wire 18 to sway would be directly opposed by the resistance of wire 17 to withstand tensile and compressive deformation along its longitudinal axis. Thus, each interposer remains rigid against forces which tend to displace it from its correct operating position. If the angle of intersection of the planes is varied, the interposer remains rigid against unwanted displacement but to a lesser degree than the rigidity obtained from an angle of intersection of 90°. As the angle of intersection of the planes is made smaller, the interposer is more susceptible to sway to and from a support means (approximately transverse to the longitudinal axes of the supports). As the angle of intersection is made larger, the interposer is more susceptible to movement parallel to the longitudinal axes of the supports. While an angle of intersection of 90° provides maximum rigidity, an angle of intersection of from 45° to 135° enables the device to operate quite satisfactorily for most applications.

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FIG. 4 shows an interposer having grooves 35 and 36 on its body portion which contain the wires forming the mounts. The wires are embedded in a plastic member 34, shown in perspective in FIG. 2, which prevents the wires from directly contacting the interposer and yet enables the wire mounts to be firmly affixed thereto. The portions of member 34 which lie in grooves 35 and 36 prevent the wire mounts from directly contacting the interposers in the regions of the wires which lie in these grooves. The grooves have lip portions which partially overlie the grooves.

FIG. 5 illustrates an alternate embodiment of the invention in which two interposers are shown, interposer 38 being secured to support 40 by wires mounts 41-44 and interposer 39 being secured to support 40 by wire mounts 45-48. The wire mounts may be secured to the support by swedging the ends of the wire mounts into the proper grooves provided in support 40. Any suitable means may be used to affix the wire mounts to their respective interposers. The wire mounts 41 and 44 affixed to interposer 38 form a plane, as do wire mounts 42 and 43, also affixed to interposer 38. The two planes intersect at an angle of approximately 90° and, thus, provide the maximum degree of rigidity to the interposer against unwanted swaying motion. The discussion in connection with the other embodiment of the relating the rigidity of the interposers to the angle of intersection of the planes in which the wire mounts for each interposer lie also applies to the embodiment of FIGS. 5 and 6. The longitudinal axis of each interposer is parallel to the line formed by the intersection of the planes containing the mounts for that interposer. It is seen that interposer 38 is in its normal position while interposer 39 is in its printing position against drum 1. Accordingly, the wire mounts 45-48 are flexed.

The wire mounts affixed to each interposer are staggered. For example, wires 47 and 48, which are both affixed to the printing end of interposer 39, are longitudinally displaced along the interposer. Also, wires 45 and 46, attached to the other end of interposer 39 are longitudinally displaced by the same amount. That is, one wire of the first plurality of wires (46 and 47) are disposed between the two wires (45 and 48) and one wire of the second plurality being disposed between the two wires of the first plurality. This longitudinal displacement is necessary so that when interposer 39 moves forward, wire 47 does not strike stationary wire 44 and wire 46 does not strike wire 41. The wires are displaced longitudinally a distance greater than the distance which the interposer is designed to travel. This staggering relation of the wire mounts also prevents the wire mounts of any interposer such as interposer 38 from contacting

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the mounts of any other interposer such as 39 if 38 were the interposer to be actuated. As shown at FIG. 5, any number of interposers may be arranged in a linear array in this embodiment of the invention.

FIG. 6 shows an interposer 39 in both its printing position and in its normal position, the prime numbers showing the various parts in the printing position corresponding to FIG. 5. The interposer may be actuated in the same manner as in the other embodiment. It is returned from the printing position to its normal position by both its bouncing off the resilient paper and the return of the flexed wire mounts in the same manner as the other embodiment.

It is understood that the foregoing disclosure relates only to preferred embodiments of the invention particularly with respect to a drum-type printer, and that many of its features could be utilized in other types of printing or recording devices, and that numerous modifications or alterations may be made in the invention without departing from its spirit or scope as set forth in the appended claims.

I claim:

1. In a recording apparatus, a recording element, means for positioning a record member adjacent said recording element, an interposer, means for actuating said interposer to effect a recording impression from said recording element onto said record member, a first plurality of wire mounts affixed to said interposer and a second plurality of wire mounts affixed to said interposer means for rigidly securing the ends of said mounts, the plane formed by said first plurality of mounts intersecting the plane formed by said second plurality of mounts, the line formed by the intersecting plane being parallel to the longitudinal axis of said element.

2. In the printing apparatus as defined in claim 1 wherein the said planes intersect at an angle with each other of 45°-135°.

3. In the printing apparatus as defined in claim 1 wherein the said planes intersect at an angle with each other of approximately 90°.

4. The apparatus of claim 1 further including a plurality of interposers arranged in a linear array and a plurality of means for actuating said interposers.

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