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D. M. ZABRISKIE ET AL
SHOCKPROOFED FACSIMILE RECORDER

2,961,287

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FIG. 1

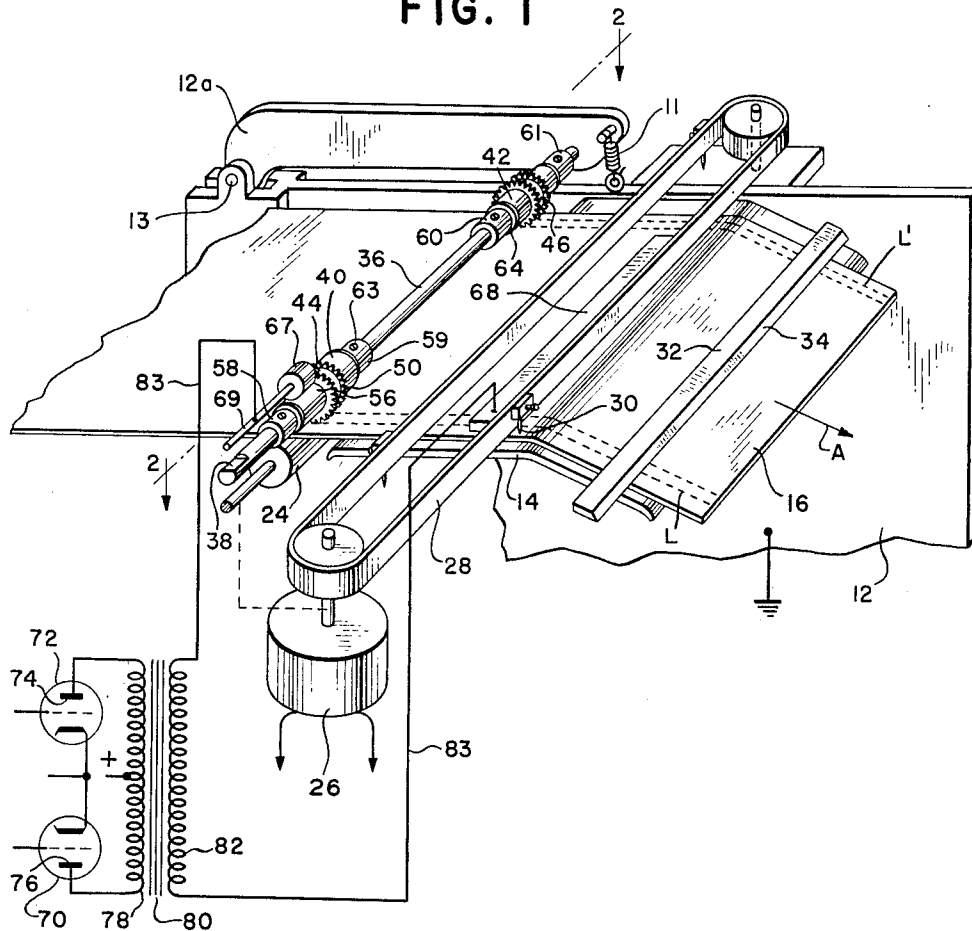
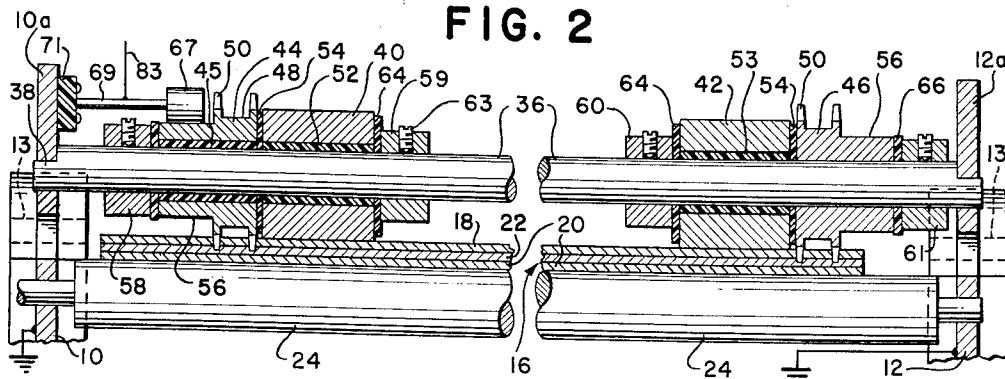


FIG. 2



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SHOCKPROOFED FACSIMILE RECORDER

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9 Claims. (Cl. 346—74)

This invention concerns an improvement in facsimile recorders including a means for removing the shock hazard in those recorders which may be contacted by operating personnel.

Recording papers such as described in U.S. Patents 2,555,321 and 2,638,422 have a carbon mid-layer disposed between upper and lower paper layers. The upper layer is partially removed during recording to expose the black midlayer. Since the upper and lower layers are substantially nonconductive electrically it is necessary in a recording machine using this type of paper to contact the conductive mid-layer to provide a return path for the recording current. This, however, presents a shock hazard to operating personnel who may touch the recorder.

In continuous sheet type recorders grounding has been accomplished heretofore by employing a strip of brush or finger contacts extending across the width of the recording paper web. This provides adequate contact to the thin top layer of the paper. The electrical path to ground is then through the distributed resistance of the top paper layer. Since the brush points make widely distributed contact with the paper, the tendency of the brush contacts to mark the paper is negligible. This electrical path to ground through the top layer of paper is not necessarily of low resistance, but it does provide satisfactory grounding of the mid-layer of the paper.

In a recorder of the type in which the recording paper web is pushed beneath marking styli by feed rollers, the added load imposed by the grounding brush above mentioned adds resistance to the paper movement and thus prevents proper operation of the recorder. Such a recorder is described in U.S. patent to Hallden et al. 2,639,211. In this preferred type of recorder, the paper is pushed past the styli and through an adjacent tear-off bar or strip so that messages recorded on the paper may be read promptly as recorded and wastage of paper between recorded messages is minimized. In this type of recorder, the operator must ordinarily grasp the paper to tear off messages as completed, and the grasp may be quite close to the high potential marking styli. The avoidance of shock to the operator thus becomes an essential factor in operation of the machine.

It is therefore a principal object of the invention to provide means for removing the shock hazard from a facsimile recorder.

A further object is to provide means for removing the shock hazard from a facsimile recorder by adequately grounding the conductive mid-layer of the recording paper at a point close to the marking styli.

Another object is to provide means for grounding a conductive mid-layer of a conductive paper without impeding movement of the paper past the recording styli.

A still further object is provision of a sharp toothed roller in a facsimile recorder for grounding the conductive mid-layer of the recording paper.

Other and further objects and advantages of the invention will become apparent from the following description taken together with the drawing, wherein:

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Fig. 1 is a perspective view of a portion of a facsimile recorder embodying the invention; and

Fig. 2 is a fragmentary sectional view on an enlarged scale taken on line 2—2 of Fig. 1 and showing details of the invention.

Referring to the drawing, there is shown a portion of a facsimile having a pair of frame side plates 10 and 12. A pair of metal levers 10a and 12a are pivoted at hinges 13 to plates 10 and 12. Springs 13 connected between the ends of the levers and the plates urge the levers toward the plates. The side plates 10 and 12 provide a support for a platen 14 over which is passed the web of recording paper 16. This paper as shown on an enlarged scale in Fig. 2 includes upper and lower paper layers 18, 20 with a conductive mid-layer 22 disposed therebetween. The paper web is pushed by the drive roller 24 over the platen 14. The roller is driven by a motor 26 which also drives a belt 28. The belt carries styli 30 which are drawn across the paper web in turn. Roller 24 may be covered with a rubber friction sleeve.

After the paper is marked by the styli it passes under a straight strip 32 having a sharp edge 34 so that the operator can tear off the message as soon as recorded without delay and without wastage of paper.

To the extent described, the structure is conventional and similar to that disclosed in the above mentioned Patent 2,639,211. Reference is made to that patent for further details of construction and mode of operation of the recorder per se.

The improvement embodying this invention is illustrated by the bar 36 which is supported transversely across the paper by the levers 10a and 12a. This bar has flattened ends 38 which secure the bar in a non-rotatable position in the levers over the papers. Freely rotatable on the cylindrical bar are two spaced idler rollers 40 and 42. The radii of these rollers are substantially equal to the spacing between the top surface of the paper and the axis of bar 36. These rollers exert sufficient pressure on the paper in coaction with drive roller 24 to advance the paper forwardly in direction A.

Adjacent each of rollers 40, 42 are wheels 44, 46. Each of the wheels has a single or double toothed peripheral section 48 formed with teeth 50. The teeth 50 should be sharpened to fine points or to fine short blade edges. The wheels 44, 46 resemble star wheels or sprocket wheels, but they are especially adapted for the present purpose by the sharpness of the teeth 50. The cutting or piercing ends of the teeth extend radially beyond the adjacent roller 40 or 42 a distance of the order of 0.005". This distance is slightly greater than the thickness of the upper layer 18 of the paper so that the ends of the teeth penetrate into but not past the center conductive layer 22 as clearly shown in Fig. 2.

The rollers 40, 42 act in effect as spacer members to limit the distance of penetration of the teeth 50 into the paper. The rollers 40, 42 may both be made of insulation material such as nylon or the like, or they may be made of metal. If they are made of metal they should be lined with electrical insulation sleeves 52, 53. Between the several rollers and adjacent wheels are placed insulating spacers or washers 54. A cylindrical extension 56 is provided on each of wheels 44, 46 to insure rotation of the teeth in perpendicular planes to the bar 36. Collars 58, 59, 60, 61 secured by set screws 63 are disposed on opposite ends of the roller assemblies to prevent axial movement of the several rollers. Further washers 64, 66 are provided between the collars and adjacent rollers 40, 42.

Wheel 44 is provided with an internal electrical insulating sleeve 45. Disposed in rotating contact with cylindrical extension 56 of roller 44 is another metal roller 67 mounted for free rotation on a shaft 69. This

shaft is supported in an insulated bracket member 71 on side plate 10.

In order to energize the marking styli, there is provided a metal bar 68 which is disposed adjacent to and in contact with the belt 28. The bar may be insulated from but supported by plates 10, 12. The recorder may have marking amplifier tubes 70, 72 whose plates 74, 76 are connected to opposite ends of a primary winding 78 of transformer 80. The secondary winding 82 of the transformer is connected at opposite ends to the guide bar 68 via wire 83 and through shaft 69 and roller 67 to wheel 44. A brush may be used instead of roller 67.

As the paper is pushed or pulled past the marking line, it is marked by the styli in turn as suitable marking potentials are applied via transformer 80. As the paper passes rollers 44 and 46 the sharp teeth or points penetrate the top layer 18 slightly but sufficiently to provide low resistance contacts to the mid-layer. Since the contacts are of low resistance no significant electrical marking takes place at these points of penetration. The teeth effect a slight embossing of the upper layer 18 as indicated by the dotted lines L and L' in Fig. 1. This embossing is not objectionable since it does not interfere with passage of the styli thereover.

Since wheel 46 is grounded through shaft 36 and levers 10a and 12a to the grounded frame plates 10, 12, it causes a reduction of the potential of the conductive mid-layer at the tear-off strip 32 to a negligible level with respect to the ground potential of walls of the recorder.

By employing two wheels 44 and 46, there is obtained a balance of the slight retarding effect imposed by the penetration of the teeth into the paper. The paper advances without wrinkling, marking or disfigurement. Since the teeth penetrate the paper only to a limited extent, they do not erode or damage the drive roller underneath. Rollers 40, 42 in addition to serving as spacers for limiting penetration of teeth 50 also serve as idler rollers for coaction with the drive roller in advancing the paper as above mentioned.

A high potential is applied via the guide bar 68 to the marking styli. The wheel 44 provides a return path for the marking current. A high potential field exists in the location of the marking stylus. This high potential field is modified so that the voltage measurable at the tear-off strip is negligibly small and incapable of imparting a shock to an operator tearing off the recorded portions of the paper.

The grounding of wheel 46 further serves as a protection against the undesirable effects of inadvertent unbalanced grounds occurring in the recording paper or the recorder itself due to imperfections, leakage, or high humidity conditions.

If desired, wheels 44 and 46 can be provided with sharpened peripheral edges instead of teeth to cut through the upper layer 18. This will result in a slight creasing of the paper, which is not objectionable. If desired the rollers 24, 40 and 42 could be located so as to pull the paper past the marking styli.

Various modifications of the device may be made without departing from the invention as defined in the appended claims.

What is claimed is:

1. In a facsimile recorder which utilizes a web of recording paper having top and bottom non-conducting layers and an intermediate conductive layer, a drive roller, a shaft carrying an idler roller, said drive roller and idler roller cooperating to advance the web through a recording location to a tear-off location, means carrying a plurality of styli across said recording location for marking the web transversely, a source of marking voltages, means for connecting said source between said styli and said conductive layer for removing portions of the top one of the non-conducting layer of the web to mark the web, and means disposed in direct contact with the

conducting layer at a location remote from the recording location for grounding the conducting layer and reducing the voltages of the web at said tear-off location to negligible magnitudes.

2. In a facsimile recorder which utilizes a web of recording paper having top and bottom non-conducting layers and an intermediate conducting layer, a drive roller, a shaft carrying an idler roller, said drive roller and said idler roller cooperating to advance the web through a recording location to a tear-off location, means carrying a plurality of styli across the recording area for marking the web transversely, a source of marking voltages, a wheel disposed on said shaft for rotation adjacent to the idler roller, said wheel having a periphery adapted to penetrate the web at a location removed from the recording location, said source being connected between said wheel and said styli for applying marking voltages to the web, and means disposed in direct contact with the conducting layer outside of the recording location for grounding the conducting layer and reducing the voltages of the web at said tear-off location to negligible magnitudes.

3. In a facsimile recorder which utilizes a web of recording paper having top and bottom non-conducting layers and an intermediate conducting layer, a drive roller, a shaft carrying an idler roller, said drive roller and said idler roller cooperating to advance the web through a recording location to a tear-off location, means carrying a plurality of styli across the recording location for marking the web transversely, a source of marking voltages, a pair of spaced wheels disposed for rotation on said shaft, one of said wheels being insulated with respect to the other, each of said wheels having peripheries adapted to penetrate the web and make direct contact with the conducting layer at a location removed from the recording location, said source being connected between said one wheel and said recording styli so that the web in the recording area carries marking currents at potentials materially higher than ground potential, the other of said wheels being at ground potential so that the voltages of the web at the tear-off location are reduced to negligible magnitudes with respect to ground potential.

4. In a facsimile recorder which utilizes a web of recording paper having top and bottom non-conducting layers and an intermediate conducting layer, a drive roller, a shaft carrying an idler roller, said drive roller and said idler roller cooperating to advance the web through a recording location to a tear-off location, means carrying a plurality of styli across the recording location for marking the web transversely, a source of marking voltages, a pair of spaced wheels disposed for rotation on said shaft, one of said wheels being insulated with respect to the other, each of said wheels having peripheries adapted to penetrate the web and make direct contact with the conducting layer at a location remote from the recording location, said source being connected between said one wheel and said recording styli so that the web in the recording location carries marking currents at potentials materially higher than ground potential, the other of said wheels being at ground potential so that the voltages of the web at the tear-off area are reduced to negligible magnitudes with respect to ground potential, each of said wheels having sharp teeth for penetrating the paper.

5. In a facsimile recorder which utilizes a web of recording paper having top and bottom non-conducting layers and an intermediate conducting layer, and means for advancing the paper through a recording location to a paper tear-off location, means for reducing the shock occasioned by contact with the conducting layer at the paper tear-off location, comprising a source of marking currents applied to the web in the recording location, means for isolating the recording currents from ground potential, and means for grounding the conducting layer at points outside of the recording location to render the paper in said tear-off location free of said shock hazard.

6. In a facsimile recorder which utilizes a web of recording paper having top and bottom non-conducting layers and an intermediate conducting layer, a drive roller, a shaft carrying a pair of spaced idler rollers, a grounded support carrying said shaft, said drive rollers and said idler rollers cooperating to advance the web through a recording location to a tear-off member, means carrying a plurality of styli across the recording location for marking the web transversely, a source of marking voltages, a pair of spaced wheels disposed for rotation on said shaft, one of said wheels being insulated with respect to the other, each of said wheels having peripheries adapted to penetrate the web and make direct contact with the conducting layer, said source being electrically in circuit with said one wheel and said recording styli so that the web in the recording location carries marking currents at potentials materially higher than ground potential, the other of the wheels being at ground potential and located away from the recording location so that the voltages at the tear-off means are reduced to negligible magnitudes with respect to ground potential.

7. In a facsimile recorder which utilizes a web of recording paper having top and bottom non-conducting layers and an intermediate conducting layer, a drive roller, a shaft carrying a pair of spaced idler rollers, a grounded support carrying said shaft, said drive rollers and said idler rollers cooperating to advance the web through a recording location to a tear-off member, means carrying a plurality of styli across the recording location for marking the web transversely, a source of marking voltages, a pair of spaced wheels disposed for rotation on said shaft, one of said wheels being insulated with respect to the other, each of said wheels having peripheries adapted to penetrate the web and make direct contact with the conducting layer, said source being electrically in circuit with said one wheel and said recording styli so that the web in the recording location carries marking currents at potentials materially higher than ground potential, the other of the wheels being at ground potential and located away from the recording location so that the voltages at the tear-off means are reduced to negligible magnitudes with respect to ground potential, each of said wheels having its periphery formed with sharp teeth.

8. In a facsimile recorder which utilizes a web of recording paper having top and bottom non-conducting layers and an intermediate conducting layer, a drive roller, a shaft carrying a pair of spaced idler rollers, a grounded support carrying said shaft, said drive rollers and said idler rollers cooperating to advance the web through a recording location to a tear-off member, means carrying a plurality of styli across the recording location for marking the web transversely, a source of marking voltages,

a pair of spaced wheels disposed for rotation on said shaft, one of said wheels being insulated with respect to the other, each of said wheels having peripheries adapted to penetrate the web and make direct contact with the conducting layer, said source being electrically in circuit with said one wheel and said recording styli so that the web in the recording area carries marking currents at potentials materially higher than ground potential, the other of the wheels being at ground potential and located away from the recording location so that the voltages at the tear-off means are reduced to negligible magnitudes with respect to ground potential, said wheels being disposed adjacent the respective idler rollers to contact the paper near opposite lateral edges thereof, the periphery of each of the wheels extending beyond the adjacent idler roller just sufficient to enter into conducting layer without entering the bottom non-conducting layer.

9. In a facsimile recorder which utilizes a web of recording paper having top and bottom non-conducting layers and an intermediate conducting layer, a drive roller, a shaft carrying a pair of spaced idler rollers, a grounded support carrying said shaft, said drive rollers and said idler rollers cooperating to advance the web through a recording location to a tear-off member, means carrying a plurality of styli across the recording location for marking the web transversely, a source of marking voltages, a pair of spaced wheels disposed for rotation on said shaft, one of said wheels being insulated with respect to the other, each of said wheels having peripheries adapted to penetrate the web and make direct contact with the conducting layer, said source being electrically in circuit with said one wheel and said recording styli so that the web in the recording location carries marking currents at potentials materially higher than ground potential, the other of the wheels being at ground potential and located away from the recording location so that the voltages at the tear-off means are reduced to negligible magnitudes with respect to ground potential, said wheels being disposed adjacent the respective idler rollers to contact the paper near opposite lateral edges thereof, the periphery of each of the wheels extending beyond the adjacent idler roller just sufficient to enter into conducting layer without entering the bottom non-conducting layer, each of said wheels having its periphery formed with circumferentially spaced sharpened teeth.

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