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ELECTROLYTIC RECORDER WITH RECORDING MEDIUM CONDUCTIVITY RESPONSIVE FEED OUT CONTROL

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FIG. 1

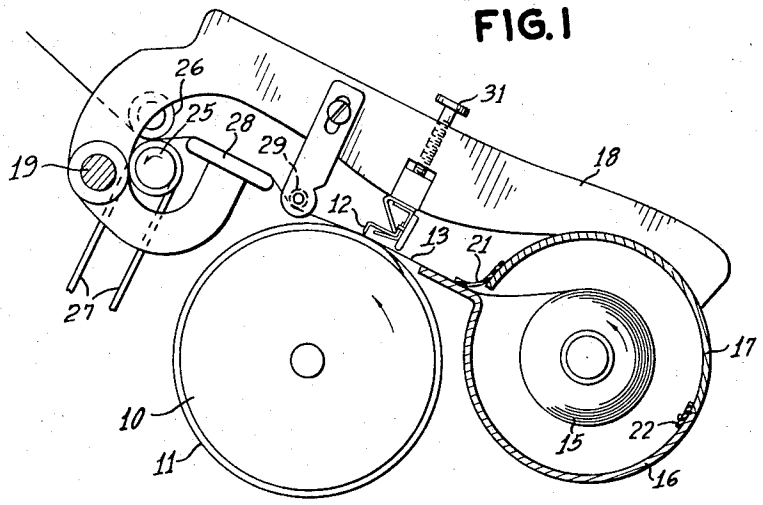


FIG. 2

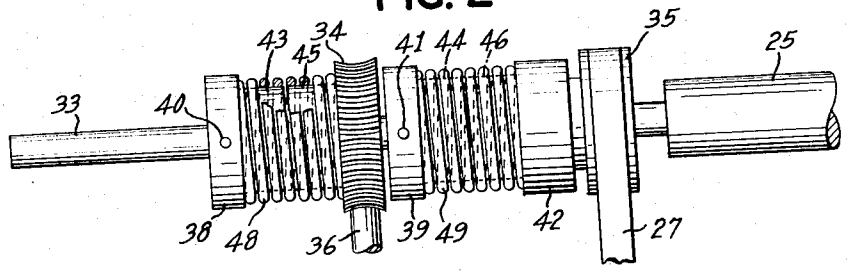
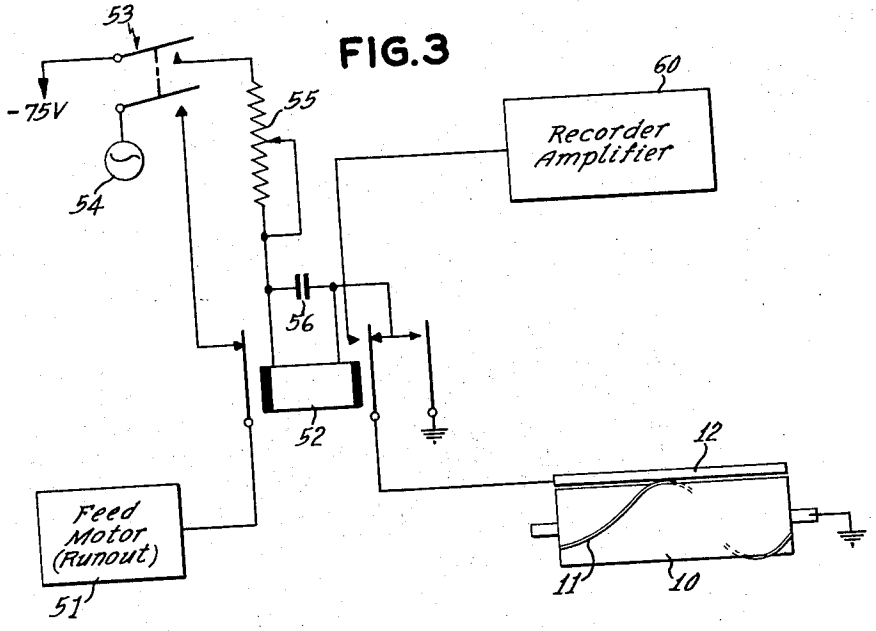


FIG. 3



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ELECTROLYTIC RECORDER WITH RECORDING MEDIUM CONDUCTIVITY RESPONSIVE FEED OUT CONTROL

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ABSTRACT OF THE DISCLOSURE

Paper runout for an electrolytic recorder controlled by the electrical conductivity of the recording paper at the recording area.

This invention relates to recorders of the type employing electrosensitive paper, and particularly to paper feed control for a recorder employing so-called "electrolytic" paper.

Where "wet" or "electrolytic" papers are used in facsimile recorders, for example, generally the moisture content of the paper must be maintained between predetermined limits for satisfactory recording. The paper is impregnated with chemical salts or other substances capable of rendering the paper electrically conductive when moist. The current flowing through the paper from a marking electrode or stylus produces a mark on the surface of the paper, either by introduction of foreign ions in the body of the paper, by discharge of ions at one of the electrodes in contact with the opposite side of the paper, by oxidation or reduction of the salts at the point of contact with the paper, or by deposition of metal from one of the electrodes which reacts with the compounds or substances contained in the paper. In order to obtain satisfactory recording density and sharpness, the moisture content of the paper must be maintained within a narrow range. Thus difficulty is encountered where the paper is exposed to the air for any appreciable time before being recorded if this exposure materially changes the moisture content of the paper.

In most cases the supply of recording paper is sealed in an air-tight container mounted adjacent to the recording mechanism, and withdrawn through a sealed opening when the paper is to be marked or recorded on. However, the length of paper between the sealed container and the point of recording is subject to ambient atmospheric conditions and may dry out to a point where it does not record properly in a short time. For example, when the recorder is stopped between transmission of successive messages, unless successive messages are transmitted without delay, the paper between the paper enclosure and the recording point dries out and becomes unusable.

In the past, this difficulty has been avoided by feeding out a predetermined length of paper when the recording of each message is initiated in order to make certain that the start of the recording would be made on a moist section of the paper. This is wasteful of paper since it is unnecessary to run out a surplus length of paper where messages follow immediately, one after the other. Accordingly, it is an object of the present invention to provide automatic control of paper feed which will run out the paper precisely to the extent necessary to insure satisfactory recording, this control being effective each time a new message is started.

Another object of the invention is to provide a rapid feed or runout of the recording paper in a facsimile recorder, the runout being controlled by the electrical conductivity of the paper at the recording area where the recording electrode engages the surface of the paper.

Still another object of the invention is to provide a simplified control system of this character in which the recording stylus or electrode is utilized as an element of the control system.

In accordance with the invention, a facsimile recorder or the like employing electrolytic paper is provided with means for rapidly feeding the recording paper through the recording area when it is dried out to a point where the quality of the recording is affected. This may occur, for example, when the recorder is operated intermittently. The paper runout is controlled by a circuit which includes the recording blade or stylus of the recording mechanism. The change in the conductivity of the paper, which is a function of the moisture content, is detected or measured by a relay which is connected to the recording blade when the recorder is started up and stops the paper runout when the moist section of the paper web reaches the recording area. In this manner, proper recording conditions are assured without feeding out more paper than required to eliminate the dried-out length occasionally encountered in the operation of the recorder.

Other objects and advantages of the invention will appear from the following detailed description of the embodiment thereof shown in the accompanying drawings, in which:

FIG. 1 is a side elevation of a facsimile recorder of the so-called electrolytic type with certain parts omitted for the sake of clarity;

FIG. 2 is a detailed view showing one form of drive and clutch mechanism for the feed roller of the recorder shown in FIG. 1; and

FIG. 3 is a schematic circuit diagram of the paper feed-out control system embodying the invention and adapted to be used for the control of a recorder such as that shown in FIGS. 1 and 2.

Referring to the drawings, FIG. 1 shows the essential components of a facsimile recorder of conventional design for use with electrolytic paper. The recording mechanism, as shown, comprises a synchronous rotating drum **10** having a helical rib **11** which cooperates with the longitudinal recording blade **12** to record facsimile signals on the interposed strip or web of recording paper **13**. Intelligence signals in the form of electrical pulses or variations are impressed between the helical rib **11** and the blade **12**. The resulting current flow through the paper web **13** produces a record of the signals, as is well known in the art. As pointed out above, where the recording type **13** is of the electrolytic paper impregnated with chemical salts, the body of the paper should contain a predetermined amount of uniformly distributed moisture for satisfactory recording. The conductivity of the paper varies with the moisture content, and thus is an indication of the suitability of the paper for effecting the desired recording.

The recording paper **13** is shown as a continuous web of paper which is drawn from a supply roll **15** contained within a sealed enclosure consisting of a bottom half **16**,

which is fixed in position, and a removable top half **17**. The top half **17** of the enclosure is supported upon a pair of parallel pivoted rocker arms **18**, only one of which is shown. The rocker arms **18** are pivoted on a shaft or bearing **19** so that the top of the sealed casing may be lifted to facilitate replacement of the supply roll **15** and of the recording blade **12**. The contacting edges of the two halves of the sealed casing may be provided with rubber sealing strips, if desired, as indicated at **21** and **22**.

The web of recording paper **13** is drawn through the recording mechanism **11, 12** by a rotatable driven feed roller **25** mounted adjacent a pressure roller **26**. The paper is gripped between the rotatable rollers **25** and **26** so that it may be advanced at a uniform slow rate by the rotation of the feed roller **25** during the recording of a message on the paper. The feed roller **25** is also provided with a drive belt or chain **27** to effect a rapid runout of the paper, as will be described below. A heating member **28** is provided underneath the surface of the recording web **13** to remove moisture from the printed copy before the copy is fed out from the recorder **15**. An adjustable tensioning roller **29** may also be provided, if desired, for adjusting the tension of the web and maintaining the web in contact with the surface of the heating element **28**. Conventional adjusting means **31** is provided for adjusting the position and pressure of the recording blade **12** on the surface of the web **13**. It will be understood that the detailed construction of the recording mechanism referred to above is merely shown by way of example and various conventional recording devices may be substituted for that shown and described.

The invention resides in the provision for controlling the feedout of the recording web **13**, for example, when the web is dried out between the sealed supply roll **15** and the recorder blade **12**. An embodiment of the invention is illustrated in FIGS. 2 and 3 by way of example. Since the normally slow paper feed during recording is much slower than that desired for the runout of paper which has been dried out by exposure to the air, a two-speed drive mechanism for the feed roller **25** is employed. The feed roller **25** is driven at a slow rate of speed by the motor which drives the helix drum **10** and since this is common in the prior art, it is not illustrated. In FIG. 2 an extension **33** of the shaft of the feed roller **25** supports a worm gear **34** and a pulley **35**, both of which are freely rotatable on the shaft extension **33**.

When the high-speed drive through the pulley **35** is not operative, the feed roller **25** is driven at the uniform slow rate of rotation required during the recording process by the worm gear **34**. The worm gear **34** may be driven as indicated by a worm on the shaft **36** connected to any suitable constant-speed motor such as that employed to rotate the helix drum **10**. An overrunning clutch drive is provided to enable the drive belt **27** through the pulley **35** to rotate the feed roller **25** at a higher speed without disconnecting the slow-speed drive through gear **34**. By way of example, the overrunning drive arrangement, as shown, includes two hub members **38** and **39**, which are pinned to the extension **33** of the feed roller shaft at **40** and **41**, respectively. The overrunning clutch devices illustrated are similar to the one-way drive overrunning clutch of the coiled spring type, which is manufactured by Curtiss-Wright Corporation Marquette Division, 1145 Galewood Drive, Cleveland, Ohio. As shown, the hub members **38** and **39** are provided with concentric shoulders **43, 44** abutting the ends of shoulders **45, 46** formed integrally with the gear **34** and drive member **42**. Each clutch assembly includes the helical coiled springs **48** and **49**, respectively, which are of substantially the same inside diameter as the outside diameter of the shoulders **43–46** and cover substantially the entire length of the shoulders. As well known in the art, such a clutch configuration results in a one-way drive since the inside of the coiled spring tends to wind up and grip the surfaces of the hubs, or unwind, depending upon the relative direction of rotation.

Therefore, while the drive is effected through the worm gear **34**, the pulley **35** remains stationary and has no retarding force on the rotation of the shaft of the feed roller **25**. However, when the runout drive belt **27** rotates the pulley **35** at a higher speed, the feed roller **25** rotates at the high runout paper speed determined by the rotative speed of the pulley **35**. Other suitable drive mechanisms obviously may be substituted for that shown by way of example.

FIG. 3 shows a circuit diagram of a typical control system for the paper feed described above. Referring to this figure, the feed motor **51** for driving the feed roller **25** through belt **27** is connected through normally closed left-hand contacts of a relay **52** and the contact of a manually or automatically operated switch **53** to a source of a current **54** for operating the motor. The switch **53** is closed at the beginning of a message to start the recorder. Relay **52** is connected in series from a source of negative potential, upper contacts of switch **53**, an adjustable rheostat **55**, the winding of relay **52**, and the normally closed right-hand contacts of relay **52** to the recording blade **12**, which is in contact with the recording paper. Relay **52** is shunted by a capacitor **56** to render the relay slow to operate or release. If the recording paper between the recording electrodes **11** and **12** is too dry to record properly, the conductivity of the path through the winding of relay **52** is too low to permit the relay to operate and the feed motor **51** runs out a length of the recording web at a relatively high speed. The rheostat **55** permits adjustment of the point at which the relay **52** operates.

When the runout of recording paper brings a moist section of the paper suitable for recording underneath the recorder blade **12**, the increased conductivity through the paper operates relay **52** to open the circuit of the feed motor **51**. At the inner normally open contacts of relay **52**, the recorder amplifier **60** is connected to the recording mechanism **11, 12** and recording starts. Relay **52** is locked up through a locking circuit, including the right-hand outer normally open contacts of said relay, until switch **53** opens at the end of the message.

It should be understood that the detailed disclosure is for the purpose of illustration only, and the invention includes all modifications and equivalents which fall within the scope of the appended claims.

What is claimed is:

1. An electrical recorder for marking a web or strip of recording paper of the type which dries out upon exposure to the atmosphere during intermittent operation of the recorder, comprising:

recording mechanism,

means for feeding the web of recording paper through said recording mechanism during recording, and

runout means responsive to the electrical conductivity of the paper for rapidly feeding out a length of paper which is dried to a point that affects the recording.

2. An electrical recorder according to claim **1**, in which said runout paper feed means includes the recording element of the recording mechanism.

3. An electrical recorder according to claim **1**, in which a relay is provided for controlling the paper runout, said relay being connected in series with an element of the recording mechanism to be responsive to the electrical conductivity of the paper.

4. An electrical recorder according to claim **1**, in which means is provided to measure the conductivity of the paper at the recording area each time the recorder is started in operation.

5. An electrical recorder employing a recording strip or web of electrolytic paper comprising:

a recording blade in contact with said strip or web of paper,

means for rapidly feeding out a length of said strip or web of paper, and

relay means in circuit with said recording blade for energizing said paper feeding means in response to a predetermined electrical conductivity of the strip or web of paper at the point of contact with said recording blade.

6. An electrical recorder according to claim 5, in which said relay means controls the time when the recording of signals starts on said recording strip or web.

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