March 10, 1970 D. R. FOERSTER 3,500,437

MARKER DEVICE

Filed April 9, 1968 2 Sheets-Sheet 1

Fig. 1.

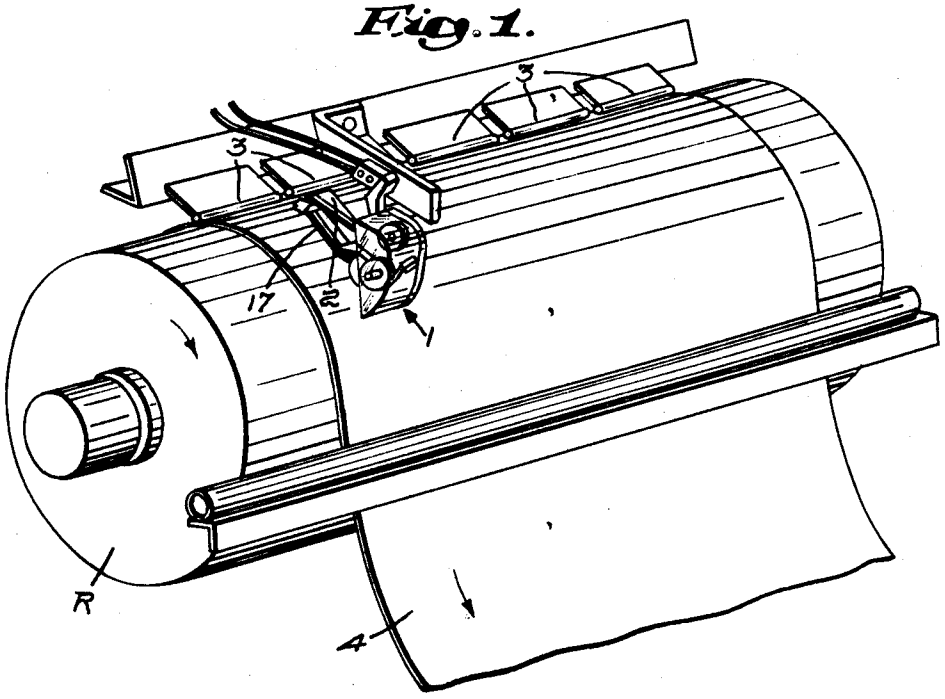
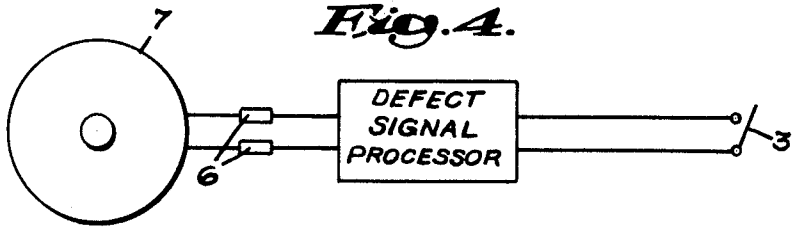


Fig. 4.



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Fig. 3.

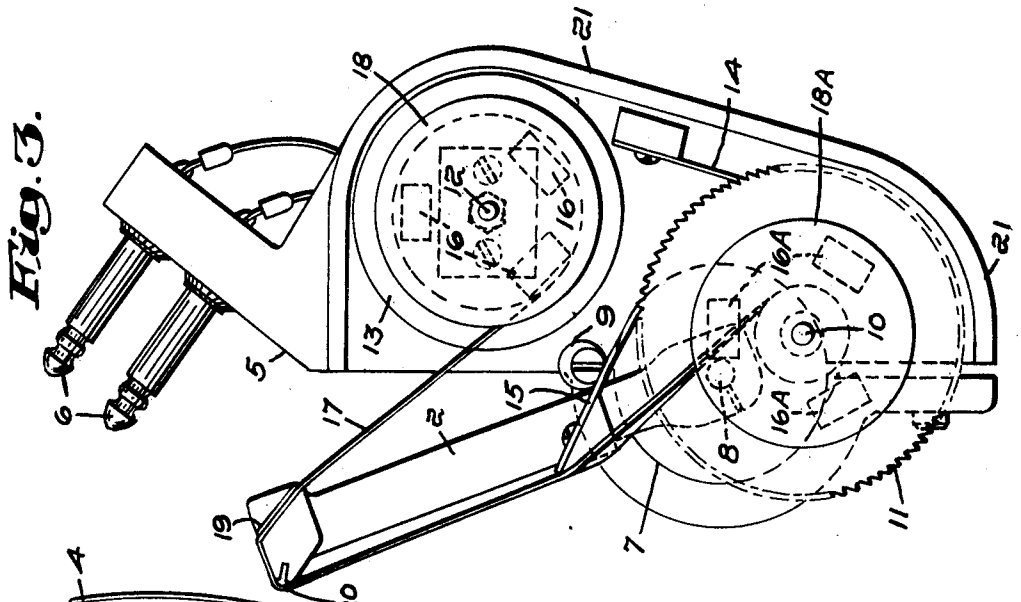
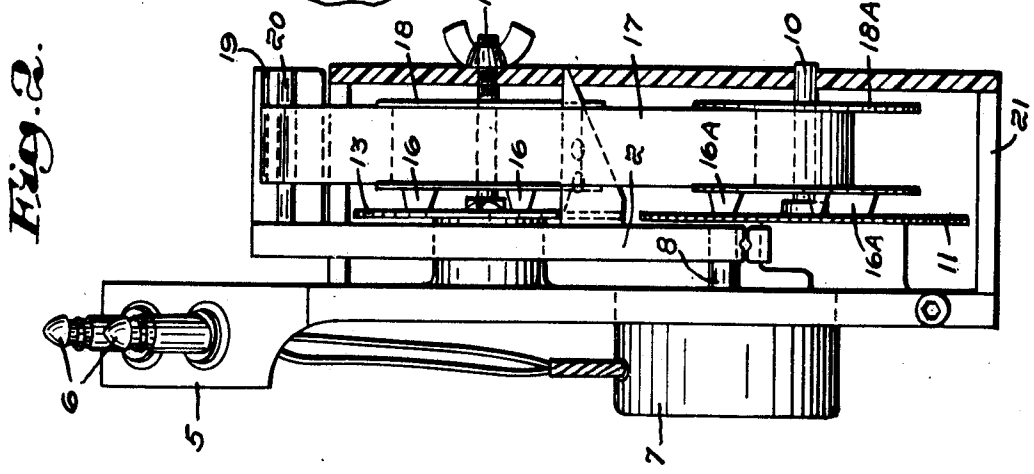


Fig. 2.



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MARKER DEVICE

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ABSTRACT OF THE DISCLOSURE

A marking device for making a mark on a moving web in response to a signal from a remote actuator such as a defect detector. A pressure transferable marking tape extends between a feed reel and a take up reel and across the striking head of an impression arm. When the arm is rotated, the striking surface carries the tape into contact with the moving web. A magnetic drag brake is provided for the marking tape.

BACKGROUND OF THE INVENTION

This invention relates to marking devices in general and, more particularly to an apparatus for marking a rapidly moving web of paper upon actuation by a remote decision means which is normally a defect detector. Marking the paper facilitates manual locating of the defect for inspection at a later time.

Prior art devices of this type are deficient in several aspects and fall into two primary categories, the first being the crayon marker. The crayon marker requires continual adjustment as it wears, which is difficult to automate due to the slow rate of wear and the inconsistent wear characteristics not only among various crayons, but also within a single crayon. In addition, crayons frequently break. The second category is the wet ink or similar inking devices. Such devices tend to produce marks that smudge or offset. When a fast drying ink is selected to overcome these difficulties, the marking device often dries out and must be primed or replaced.

SUMMARY OF THE INVENTION

In the present invention, a pressure transferable marking tape is extended in tension between a feed reel and a take up reel and across the striking head of an impression arm. The arm is rotated about a pivot at one end causing the striking surface, at the opposite end, to strike a moving web. Rotation can be provided by a number of means, a rotary solenoid being preferred. The tape, being interposed between the web and the striking head, marks the web. The marking apparatus provides for incremental traverse of the tape across the striking head from the storage reel to the takeup reel, while maintaining tension in the tape.

As it is an object of this invention to make a mark on the web which will not smudge or offset, the tape must carry a marking substance of such capabilities.

Conventional typewriter ribbons having been found to have the desired characteristics, it is a further object of this invention to provide an apparatus which will utilize such ribbons.

It is also an object of this invention to provide a marking device operable in response to a remote signal means.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the invention as it is installed on the machinery with which it is used.

FIG. 2 is a front elevation view of the invention looking from the direction of the web showing the cover in partial section.

FIG. 3 is a side elevation view of the invention with the top of the cover removed.

FIG. 4 is a schematic view of the actuating circuit.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, there is shown in perspective view a preferred embodiment of the marker device of the present invention, indicated generally by the reference numeral 1. The marker device includes a pivotally mounted marker arm 2 which is movable between a rest position and an impression position. The specific structure of the marker arm 2 and the other components of the marker device 1 will be described below in greater detail.

At the present time, it is sufficient to note that the marker device is mounted downstream from and in very close proximity to a plurality of defect detectors 3 which respond to defects of a predetermined character in the moving web 4. Various types of defect detectors can be employed in conjunction with the marker device of the present invention. A typical defect detector is described in United States Patent No. 3,037,381 issued June, 5, 1962 to C. P. Grant et al. for Bump Detector.

The physical and geometrical relationships of the marker device 1, the defect detectors 3, the moving web 4 and the back-up roll R are quite important to the optimal operation of the present invention. Since the purpose of the marker device is to provide a visual mark on the moving web 4 to indicate the presence of a defect in the web, the marker device should be located as close as possible to the defect detectors 3 in order to avoid elaborate electrical delay circuitry. When the defect detectors 3 detect a defect in the moving web, the marker device 1 is actuated immediately. Since the web 4 is moving, and the marker device is in close physical proximity to the defect detectors 3, the marker device will produce a mark on the moving web preferably near one edge thereof and substantially on a line which makes a right angle with said edge and which passes through the detected defect.

It will be appreciated that the apparatus of the present invention, unlike a conventional typewriter, must produce a mark on a moving surface, such as moving web 4. This requirement introduces a number of problems which are not encountered in the typewriter art. For example, when the movable marker arm 2 strikes the moving web 4 in its impression position, the moving web exerts a force on the marker arm in the flow direction of the web. If the pivot axis of the movable marker arm 2 is parallel to the flow direction of the web, the force exerted by the moving web on the marker arm will tend to twist or distort the arm. In addition, there will be a tendency to smear or elongate the impression left by the movable marker arm on the moving surface.

These problems are eliminated in the present invention by mounting the marker device 1 with the pivot axis of the movable marker arm 2 substantially at a right angle to the flow direction of the moving web 4. Thus, when the movable marker arm contacts the moving web, there is no twisting or distorting force on the marker arm and the arm is free to move away from the web. Furthermore, the impression or defect mark which is transferred to the moving web is well defined and sharp.

The substantially transverse relationship between the pivot axis of the movable marker arm 2 and the flow direction of the moving surface or web 4 is one of the important features of the present invention. The other geometrical relationships of the marker apparatus will be described below in connection wih the description of the marker.

Referring to FIGURES 2 and 3, the various parts of the apparatus are mounted on a support frame 5. A pair of plugs 6 serve to secure the apparatus to the mounting brackets (FIG. 1) as well as to transmit the actuating signal to a rotary solenoid 7 of the conventional type

having an internal return spring (not shown). The solenoid 7 is mounted on the frame 5 so that its armature shaft 8 extends through and beyond the opposite side of the frame 5. The marker arm 2 is secured at one end to the armature shaft 8 so that actuation of the solenoid 7 pivots the marker arm 2 toward the moving web. nA adjustable marker arm stop 9 is mounted on the frame 5 so that from a rest position against the stop 9 the proper amount of rotation is available for the marker arm 2 to operate the ratchet assembly as hereinafter described.

A shaft 10 extends from the frame 5 having a ratchet wheel 11 rotatably mounted thereon. A second shaft 12 also extends from frame 5 on which is fixedly mounted a disc 13. A hold back pawl 14 and a drive pawl 15 are mounted on the frame 5 and the marker arm 2 respectively, both in contact with the ratchet wheel 11. One or more magnets (three are shown here) 16 and 16A are circumferentially fixed by an adhesive or otherwise to the disc 13 and the ratchet wheel 11 respectively.

Thus assembled, the device is ready to receive the tape assembly consisting of a conventional typerwiter ribbon and reels having ferrous sides and comprising a tape 17, a feed reel 18 and a take up reel 18A. The feed reel 18 is placed on the second shaft 12 and the take up reel 18A on the shaft 10 such that both reels will rotate clockwise (as seen in FIG. 3) when the tape 17 is transferred from the feed reel 18 to the take up reel 18A. The ferrous sides of the reels 18 and 18A contact the magnets 16 and 16A and are slidably held by magnetic attraction.

The tape 17 is threaded from the feed reel 18 through a slot 19 and across a striking surface 20 of the marker arm 2 and finally to the take up reel 18A. The striking surface 20 comprises an insert of softer material, such as casting resin, so that suitable force may be provided upon the tape 17 against the moving web 4 to be marked without cutting through the tape or the web.

Finally, a protective cover 21 is secured over the tape assembly. The complete assembly may now be installed on the machine frame by means of the plugs 6.

Actuation of the apparatus is initiated as shown in FIG. 4 by an electrical signal from a defect detector such as a bump detector, illustrated as a switch 3 in FIG. 4. The signal is transmitted through a signal processor for example, for amplification, through the plugs 6 to the rotary solenoid 7.

When a defect is detected in the rapidly moving web 4, the rotary solenoid 7 is thus actuated causing the marker arm 2 to rotate from a rest position against the marker arm stop 9 toward the web 4 as the web is carried along the circumference of a rotating roll (FIG. 1). On contact, the marking substance carried by the tape 17 is transferred to the web 4 due to the pressure of the striking surface 20. The marker arm 2 is immediately disengaged from the web 4 due to the force of the return spring in the solenoid 7 which brings it back to the rest position.

The frictional forces upon the tape 17 as it passes across the striking surface 20 and through the slot 19 are sufficient to cause an increment of the tape 17 to be unwound from the feed reel 18 against the braking force of the magnets 16 during the striking portion of the cycle. As the marker arm 2 returns to the rest position, the interaction of the drive pawl 15, the ratchet wheel 11, the magnets 16A and the take up reel 18A rotate the take up reel 18A an amount which is sufficient to take up the portion of the tape 17 previously unwound.

It is, therefore, appreciated that the magnets 16 and 16A provide braking means to maintain proper tension on the tape 17, the magnets 16A additionally acting as a friction clutch to rotate the take up reel 18A.

The slot 19 in addition to the purpose described above, prevents dislodgement of the tape 17 from its proper position across striking surface 20.

When substantially all of the tape on the feed reel 18 has been transferred to take up reel 18A, the tape assembly is removed, inverted and reinstalled exactly as in the case when it is utilized on a typewriter.

In addition to the relationship of the marker arm 2 to the moving web 4 as described above, it is important that the tape 17 be positioned so that its longitudinal axis is substantially parallel to the flow direction of the web at the point of contact. In this way the force exerted on the tape 17 by contact with the web is transmitted longitudinally along the tape 12 to the feed reel 18 where it is substantially absorbed by the resistance of the magnets 16. If the longitudinal axis of the tape 17 is transverse to the flow direction of the web 4, the dragging force upon contact will tend to collapse or wrinkle the tape thereby substantially increasing the risk of a tape jam and other problems.

It is intended to cover all changes and modifications of the preferred embodiment herein chosen for purposes of the disclosure which do not constitute departures from the spirit and scope of the invention.

I claim:

1. An apparatus for marking a moving web comprising: a support for mounting said apparatus adjacent to said moving web; an impression arm pivotally mounted at one end on said support, and having at its other end a striking surface; a rotatable feed reel and a rotatable take up reel mounted on said support, said reels having at least one ferrous side; a pressure transferable marking tape stored on said feed reel and extending in tension between said striking head and said moving web to said take-up reel, such that, movement of said impression arm to contact with said moving web pulls said tape from said feed reel by frictional tensile force thereupon and impresses it against said moving web; means for pivoting said impression arm from a rest position to an impression position and returning it to the rest position; at least one magnet fixed to said support and in contact with said ferrous side of said feed reel to inhibit rotation thereof; a rotatable ratchet disc mounted concentrically with said take-up reel; a pawl mounted on said impression arm operably engaging said ratchet disc; and at least one magnet secured to said ratchet disc and in contact with said ferrous side of said take up reel to rotate said take-up reel in cooperation with rotation of said impression arm.

2. The apparatus of claim 1 wherein said impression arm has its pivot axis transverse to the flow direction of said moving web.

3. The apparatus of claim 2 wherein said tape has its longitudinal axis substantially parallel to the direction of movement of said web at the point of contact therewith.

4. The apparatus of claim 3 wherein said tape carries a marking substance which will not smudge or offset.

5. The apparatus of claim 1 wherein said impression arm pivoting means comprises a rotary solenoid operably connected to said impression arm.

6. The apparatus of claim 1 wherein said striking surface has a slot for receiving said tape for preventing dislodgement therefrom.

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U.S. Cl. X.R.

73—159; 197—151; 242—75.4