Dec. 1, 1953 O. G. SCHEUERMANN 2,661,044

LENGTH CONTROL FOR SLIDE FASTENER MACHINES

Filed May 19, 1948 2 Sheets-Sheet 1

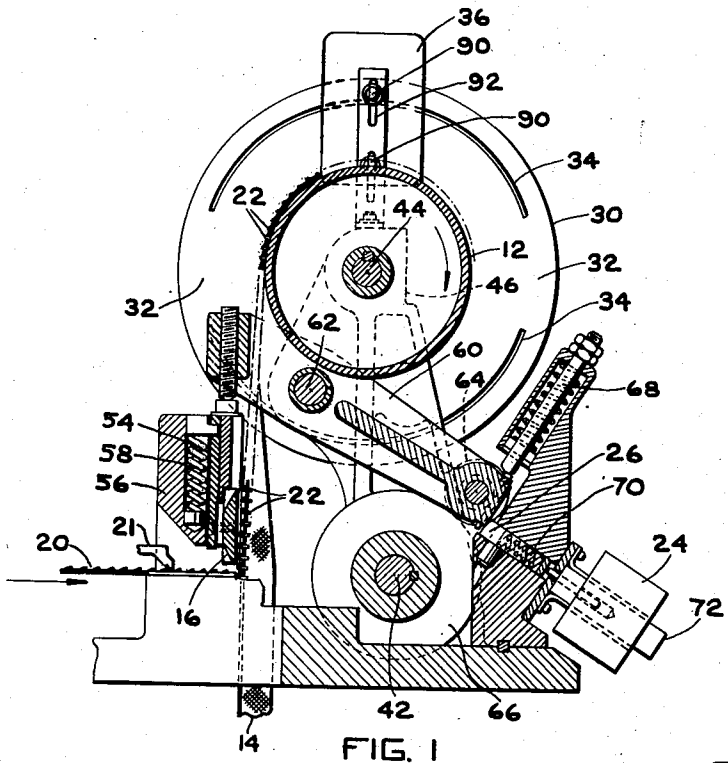


FIG. 1

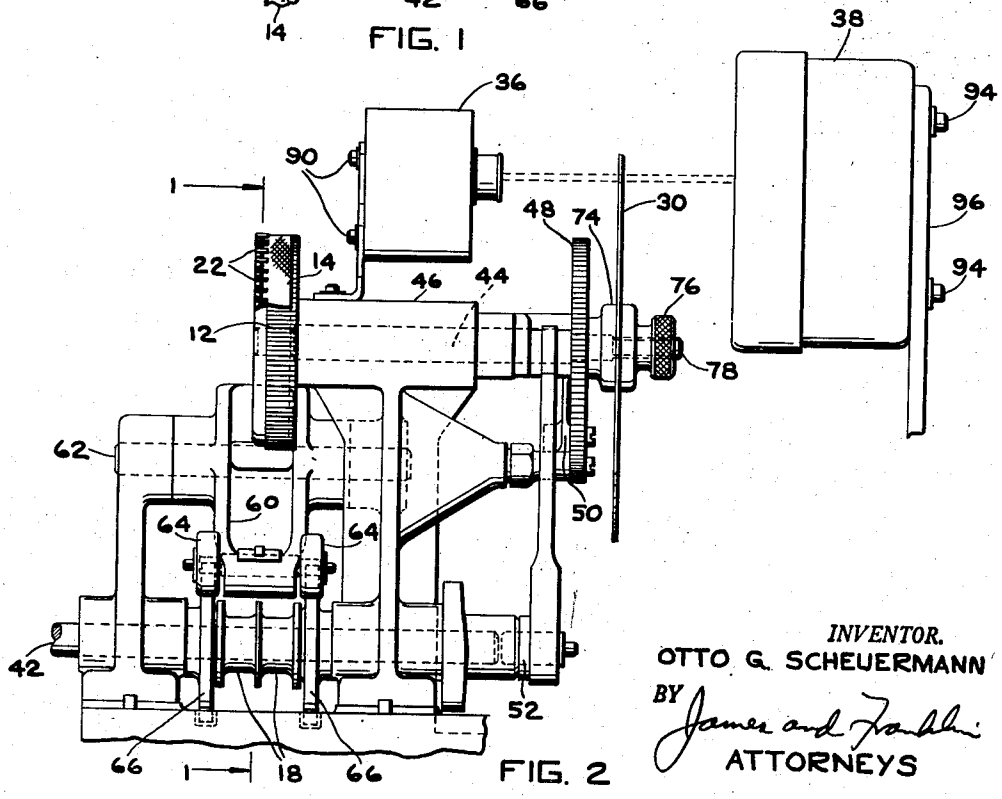


FIG. 2

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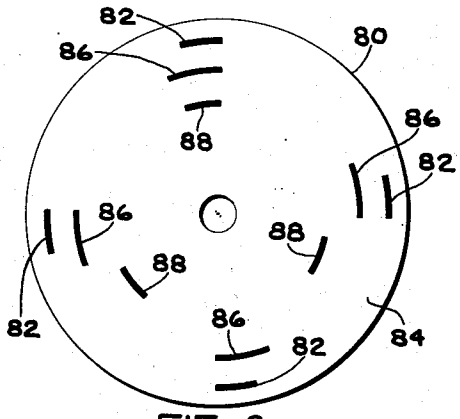


FIG. 3

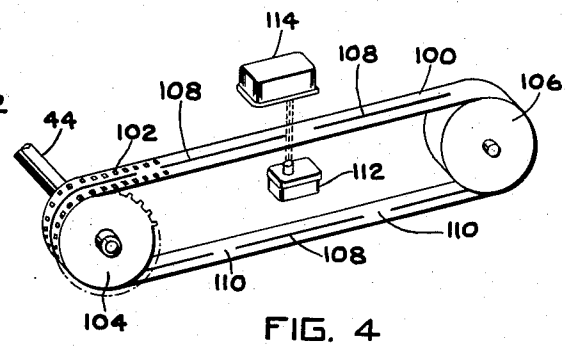


FIG. 4

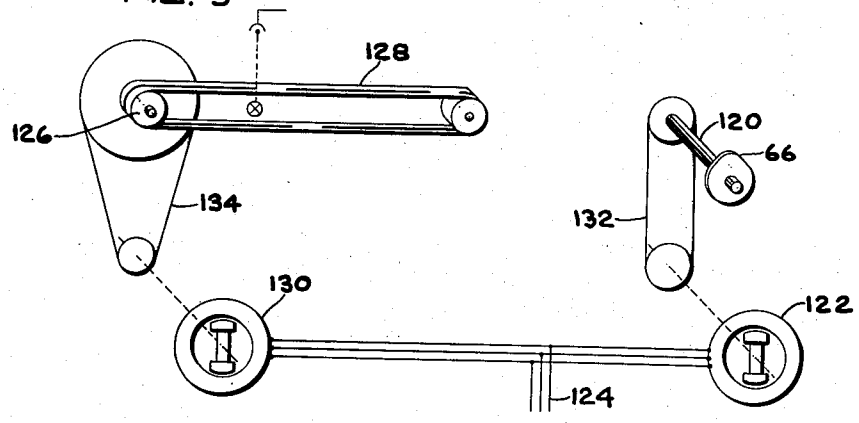


FIG. 5

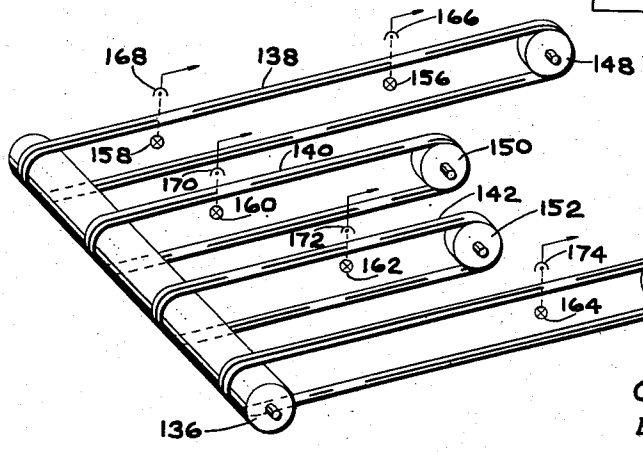


FIG. 6

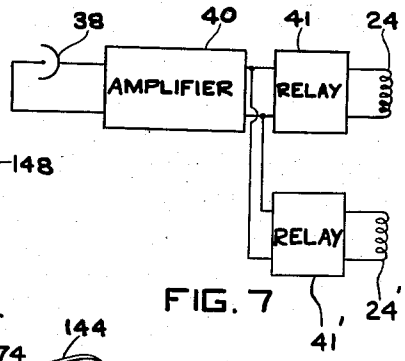


FIG. 7

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LENGTH CONTROL FOR SLIDE FASTENER MACHINES

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10 Claims. (Cl. 153—1)

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This invention relates to machines for making slide fastener chain, and more particularly to mechanism for controlling the length of the stringers and the gap spaces therebetween.

A slide fastener comprises a pair of stringers, each consisting of a tape having interlockable fastener elements or so-called "scoops" secured along one edge thereof. It is customary to first manufacture a continuous chain of stringers, which is later cut into individual stringers. The chain consists of a tape having a series of scoops corresponding to the desired length of fastener, followed by a blank space or gap devoid of scoops, followed by another series of scoops of the same length, and so on.

One method of control heretofore employed is to count the number of scoops attached to the tape. The mechanism required for this purpose is complex, and the length of the stringer may vary somewhat depending upon slight changes in pitch between scoops. The variation in pitch may be slight, but is cumulative, and in a long stringer may cause an appreciable change in length. It has also been proposed to use electrical contacts operated by an endless chain with attached blocks, or by an insulation band, but these arrangements are troublesome because of dirt coming between the contacts.

One object of the present invention is to generally improve length control mechanism, and to overcome the foregoing difficulties.

A further object is to provide a length control mechanism which will produce stringers of identical length, so that on putting two chains together the ends of the stringers on one chain will line up with the corresponding ends on the opposite chain. When the ends do not line up, excessive scoops have to be removed in a separate operation which adds greatly to the cost of the fastener.

To accomplish the foregoing general objects, and other more specific objects which will hereinafter appear, my invention resides in the length control mechanism and the elements thereof more particularly described in the following specification, and sought to be defined in the claims. The specification is accompanied by drawings in which:

Fig. 1 is a partially sectioned elevation of one form of chain machine or so-called "scoop machine" embodying features of the present invention, said section being taken approximately in the plane of the line 1—1 of Fig. 2;

Fig. 2 is a side elevation of the machine;

Fig. 3 shows a modified type of disk which may be used in the machine shown in Figs. 1 and 2;

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Fig. 4 is a perspective view schematically showing another modification in which an endless band is applied instead of a disk;

Fig. 5 is a schematic illustration of still another modification of the invention in which the control mechanism may be located remotely from the scoop machine being controlled;

Fig. 6 is a schematic showing of still another modification in which a number of different scoop machines may be controlled from a single remote control point; and

Fig. 7 is a box diagram of a part of the apparatus.

Referring to the drawings, and more particularly to Figs. 1 and 2, the apparatus there shown comprises means 12 to intermittently feed a slide fastener tape 14, and means including a punch 16 (Fig. 1) and clamping jaws (not shown) operated by cams 18 (Fig. 2) for applying slide fastener elements to the tape, a series of such elements being shown at 20 (Fig. 1) and the attached elements being shown at 22. The scoop machine may be of the type shown in U. S. Patent 2,338,884 granted to Frederich Ulrich on January 11, 1944, and parts herein omitted may be made as there shown.

There is an electrically operated means, specifically a solenoid 24 and detent 26, to interrupt the attachment of slide fastener elements or scoops while affording continued feed of the tape. The control means for solenoid 24 includes a member 30 moved by the tape feed means 12, and having opaque portions 32 and transparent portions 34. There is also a lamp at 36 (Fig. 2) which directs a beam of light at the member 30, and a light responsive cell 38 on the opposite side of the member 30. The latter is connected through an appropriate amplifier and relay to the solenoid 24, this being schematically indicated at 40 and 41 in Fig. 7. In the present case the transparent portions 34 correspond to the fastener length, while the opaque portions 32 correspond to the gap spaces between the fasteners. The number of stages in the amplifier and the design of the relay are so selected as to provide not only the desired amplification, but also to operate the solenoid in proper sense, that is, to energize it for gap spaces.

Considering the arrangement in greater detail, the present machine is an attaching machine for severing individual elements or scoops from a scoop wire, and attaching the same to the tape. The scoop wire is shown at 20 (Fig. 1), this being a wire which is previously coined to form embryo or partially completed scoops, which however remain integrally connected for convenient han-

dling. The wire 20 is intermittently fed toward the tape 14, and the endmost element is severed therefrom by the punch 16. At this time the jaws of the element are astride the beaded edge of the tape, and are clamped together by suitable clamping plates which are operated by the cylindrical cams 18 (Fig. 2) mounted on the main cam shaft 42.

The tape with the elements secured thereon is fed around a knurled or roughened feed drum 12, against which it is held by means of a pressure shoe, not shown. The drum 12 is keyed to a shaft 44 journalled in a stationary bearing 46 and carrying a ratchet wheel 48 on its opposite end. The ratchet wheel is intermittently moved by a feed dog 50, which in turn is actuated by an eccentric 52 mounted on a main cam shaft 42.

The punch 16 (Fig. 1) is mounted on a ram 54 which is vertically slidable in a ram housing 56, the ram being urged upwardly by a return spring 58. The ram is actuated by means of a ram lever 60 pivoted at 62 and carrying cam rollers 64 riding on cams 66. The cam rollers 64 may be held in close engagement with the cams 66 by means of a spring backed plunger 68 acting on a wear plate on lever 60.

To produce a gap space, the punch 16 is held in down position thereby locking the wire 20 in down position and thereby separating it from a wire feed dog 21 while the tape feed continues. To hold the punch 16 in down position, the end of lever 60 is held in up position by the slide or detent 26 previously referred to. Detent 26 is normally held in outer or disengaged position by a return spring 70 housed within a cut-out in the slide and backed up by a pin passing through the cut-out. When the solenoid 24 is energized, the plunger 72 is pulled toward the lever 60 and moves the slide or detent 26 beneath the end of the lever, thus holding the lever in upward position. When the solenoid 24 is de-energized, the return spring 70 pulls the detent to outer position, thereby freeing the lever for continued operation of the punch, so that the severing and attachment of scoops is resumed.

The disk 30 is secured to shaft 44 and rotates with the same. For this purpose it is locked between the hub 74 of the ratchet wheel 48 and a nut 76 screwed on a threaded extension 78 of the shaft 44. By loosening the nut 76 and setting the disk 30, the position of the slots 34 relative to the drum shaft 44 and the main cam shaft 42 may be adjusted. In this way a definite relation between the ends of the slot and the position of the cams 66 may be established so that the solenoid will be energized at the exact moment that the punch is to be held in down position. So long as the light rays from lamp 36 are interrupted by disk 30, the solenoid remains energized and a gap space is produced on the stringer chain.

Instead of using an opaque disk with transparent slots, a transparent disk may be used with opaque bands or lines painted thereon. Such a disk is shown in Fig. 3, in which transparent disk 80 has arcuate lines 82 painted thereon by means of a suitable opaque paint. In this case the length of the transparent arc 84 between lines 82 controls the length of the series of scoops, while the length of the arcs 82 determines the length of the gap spaces between series.

If desired, a single disk may be used for fasteners of different length. Thus in Fig. 3 there is another series of arcs 86 on a circle of different radius, and still another series of arcs 88 on a circle of still different radius.

Reverting now to Figs. 1 and 2, it will be seen that the lamp housing 36 may be adjusted vertically by means of screws 90 passing through slots 92. The photo-electric cell 38 is similarly vertically adjustable by means of screws 94 passing through slots in the vertical support bracket 96. The lamp and cell thus are adjusted radially with respect to the disk to cooperate with a desired ring on the disk. In many cases it is sufficient to move the lamp housing with its lens system, without moving the photo cell.

The use of a disk limits the fastener length and gap space to a length equal to the circumference of the tape feed drum 12 previously referred to. Moreover, even with shorter lengths of fastener it is necessary that the fastener and gap length be a sub-multiple of the circumference of the drum. For greater freedom of control it is better that the fastener length and gap space be wholly independent of the circumference of the drum. A modification for this purpose is shown in Fig. 4, in which an endless band 100 of transparent material is employed. The band may conveniently be motion picture film, for such film is already provided with sprocket holes 102 which may be used to receive the teeth of one or a pair of sprocket wheels 104. The sprocket wheels may be geared to the drum or may be mounted on an extension of the drum shaft itself. The band is held taut by means of an idler 106, the position of which is variable over a considerable distance, so that it may be set in accordance with the length of the band 100. Opaque lines 108 are painted on the band in longitudinal direction, and correspond to either fastener length or gap space length. In the present case they correspond to the fastener length, while the spaces 110 therebetween correspond to gap space length. A suitably focused beam of light is emitted from a lamp housing 112 and is directed towards a light responsive or photo-electric cell 114. The light is interrupted by the opaque lines 108 as the band is moved with the stringer tape.

The circuit shown in Fig. 7 is appropriately modified to allow for the fact that the punch is to be operated while the light beam is interrupted, and is to be stopped when the light beam passes. This change may be taken care of either by using one more or less stage of amplification in the amplifier, or by changing from a normally open to a normally closed relay, all with the end result that the solenoid 24 be energized during gap spacing.

This change is independent of whether a disk or endless band is employed, for in Fig. 3 the arcuate opaque lines might be made relatively long, with the spaces therebetween relatively short, thus necessitating the same reversal in the operation of the circuit of Fig. 7.

As so far described the control mechanism is mounted directly on or is mechanically geared to the scoop machine. This subjects the apparatus to considerable vibration, and for that reason and other reasons it may sometimes be desired to locate the control mechanism remotely from the scoop machine.

A modification for this purpose is schematically illustrated in Fig. 5, in which the main cam shaft or drive shaft 120 of the scoop machine is driven by means of a two pole synchronous motor 122 connected to a suitable alternating current power line, preferably of the three phase type as indi-

cated at 124. The sprocket wheel 126 for the endless tape or band 128 is similarly driven by a two pole synchronous motor 130, said motor being connected to the same power line 124 as the motor 122. Because the motors are synchronous motors, the control band 128 will be moved in proper relation to the fastener tape. Moreover, by using two pole synchronous motors, the exact position of the cams, for example the punch operating cam 66', may be established in relation to the position of the ends of the opaque and transparent portions of the control band 128. The desired relation will reestablish itself as soon as the motor 122 comes up to speed, even though the motor has been stopped for machine repair or for the introduction of a new reel of scoop wire, etc. Of course, the drives shown at 132 and 134 must be positive drives, of say gear or chain type. Moreover, when there are multiple opaque and blank spaces around the band, as shown in Fig. 5, these spaces must be of exactly the same length.

When using a remote control arrangement, it is possible to control a number of different machines from a single control point. When the different machines are making fastener chain having stringers of identical length, a control arrangement such as that shown in Fig. 5 may be used, the wiring from the relay (Fig. 7) extending to a plurality of solenoids, one on each scoop machine. However, it is also possible to control a number of scoop machines producing fasteners of different length. Such an arrangement is schematically illustrated in Fig. 6.

The drum 136 schematically represents a shaft carrying a series of sprocket wheels for driving a series of bands 138, 140, 142 and 144. The sprocket wheel shaft is driven by a two pole synchronous motor corresponding to the motor 130 shown in Fig. 5. The bands may be of different length depending on the length of fastener to be made, and the idle wheels or rollers 146, 150, 152 and 154 respectively, may be adjustably positioned to hold the bands taut, much as previously described when dealing with only a single band. The bands are provided with lamps 158, 160, 162 and 164 and cooperating photo-electric cells 168, 170, 172 and 174. It will be understood that the photo-electric cells are each followed by a suitable amplifier and relay connected to the solenoid of a scoop machine, all as previously described. The plurality of scoop machines are driven by a plurality of synchronous motors (preferably two pole) and are connected to the same power supply line as the single synchronous motor which moves the series of bands 138, 140, 142 and 144.

The band 138 in Fig. 6 illustrates another possibility, namely the use of another lamp 156 and photocell 166 associated with the same band 138 as the lamp 158 and photocell 168. Each of the photocells may be followed by a suitable amplifier and relay connected to the solenoid of a scoop machine. In such case the scoop machines make fasteners of identical length. Moreover, the response of a single cell, 168, may be applied to a plurality of relays and scoop machines, as indicated at 24' and 41' in Fig. 7.

It is believed that the construction and operation of my improved mechanism for controlling the length of slide fasteners and the gap spaces therebetween, as well as the advantages thereof, will be apparent from the foregoing detailed description. It will also be apparent that while I have shown and described my invention in several preferred forms, changes may be made in the structures shown without departing from the spirit of the invention as sought to be defined in the following claims.

In the claims the reference to "scoop machine" is not intended to imply or limit the machine to one using slide fastener elements which are scoop shaped, for in some cases the slide fastener elements are symmetrical elements which are not at all scoop shaped but which nevertheless (for convenience) are referred to in the art as "scoops." Moreover, in those claims in which reference is made to the lengths of the opaque and transparent portions controlling the lengths of the stringers and the gap spaces, it is not intended to limit to or imply a respective relation in the order named, for manifestly the opaque portion may control either the fastener length or the gap space, and the transparent portion may control either the gap space or the fastener length. In the claims the reference to the movable member being geared to the tape feed means or to the tape feed drum, is intended to mean any mechanical or electrical connection such as will relate one to the other to produce proportional movement, and is not intended to be limited to the use of a common shaft or toothed gearing in a literal sense.

I claim:

1. Control means for use with a scoop machine having means to intermittently feed a slide fastener tape, means to apply slide fastener elements thereto, and electrically controlled means for interrupting the attachment of slide fastener elements while affording continued feed of the tape, said control means including a member geared to the tape feed means and having a continuous opaque and a continuous transparent portion of substantial length, a lamp for directing a beam of light at said member, a light responsive cell on the opposite side of said member, and circuit means interconnecting said light responsive cell and the electrically controlled interrupting means of the scoop machine, whereby the lengths of the continuous opaque and continuous transparent portions in the direction of movement of said movable member correspond to and determine the length of the fastener stringers and the length of the gap spaces between stringers.

2. Apparatus as defined in claim 1 in which the movable member is a disk, and in which the tape feed means includes a tape feed drum, and in which the aforesaid disk is geared to the tape feed drum for rotation therewith.

3. Apparatus as defined in claim 1 in which the movable member is a disk, and in which the lamp and cell are relatively adjustable with respect to the disk.

4. Apparatus as defined in claim 1 in which the movable member is a circular transparent disk having an arcuate continuous line of opaque material printed thereon for a substantial distance and acting as the opaque portion.

5. Apparatus as defined in claim 1 in which the movable member is an endless band of transparent film having one or more continuous lines of opaque material painted thereon in longitudinal direction for a substantial distance and acting as the opaque portion of said member.

6. Apparatus as defined in claim 1 in which the movable member is an endless band of transparent film having one or more continuous lines of opaque material painted thereon in longitudi-

nal direction for a substantial distance and acting as the opaque portion of said member, and having one or more lines of sprocket holes in longitudinal direction, and in which the tape feed means includes a tape feed drum, and in which the aforesaid band is moved by a sprocket wheel the teeth of which are received in the sprocket holes in said band, and in which said sprocket wheel is geared to the aforesaid tape feed drum for rotation therewith.

7. Apparatus as defined in claim 1 in which the scoop machine is driven by a synchronous motor, and in which the movable member is moved by a synchronous motor connected to and energized from the same power line as the first synchronous motor, whereby said control means may be located remotely from the scoop machine itself.

8. Apparatus as defined in claim 7 in which a plurality of scoop machines are driven by a plurality of synchronous motors, and in which a plurality of movable members are moved by a single synchronous motor, all of said motors being connected to a common power supply line.

9. Apparatus as defined in claim 1, in which there are a plurality of scoop machines all controlled in unison with the scoop machine referred to in claim 1, all of said scoop machines being driven in synchronism by means of a two pole synchronous motor on each scoop machine, said motors being connected to a common power supply line.

10. A plurality of scoop machines operated in synchronism, each scoop machine being driven by its own two pole synchronous motor, all of said motors being connected to a common power supply line, and a single common means driven by a two pole synchronous motor connected to said power supply line for interrupting the attachment of slide fastener elements while affording continued feed of the tape in each of said scoop machines.

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