

[54] SEWING APPARATUS FOR THE
FORMATION OF EDGE-PIPING OPENINGS

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[58] Field of Search 112/68, 66, 65, 130

[56] References Cited

UNITED STATES PATENTS

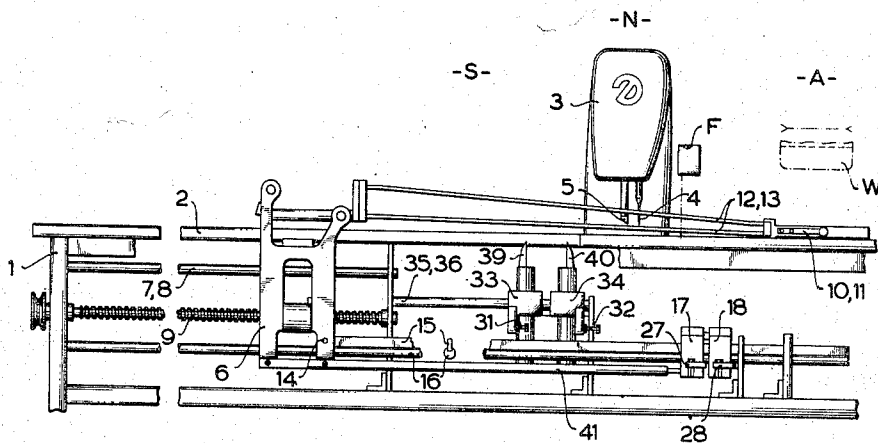
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[57] ABSTRACT

A sewing apparatus for the formation of pocket openings or slits in a fabric workpiece provided with a binder strip or piping comprises a double-needle sewing machine, blade between the needles of the sewing machine for forming the main pocket slits, and a pair of angular cutters respectively entrainable with the fabric transport device for producing angular incisions at each end of the main pocket slit. The transport device includes a slide carriage having a drag rail with which the cutter elements are entrained under the control of a sensor responsive to the leading and trailing edges of the binder strip so that the angular incisions are located properly in spite of variations in the length of the binder strip.

10 Claims, 4 Drawing Figures



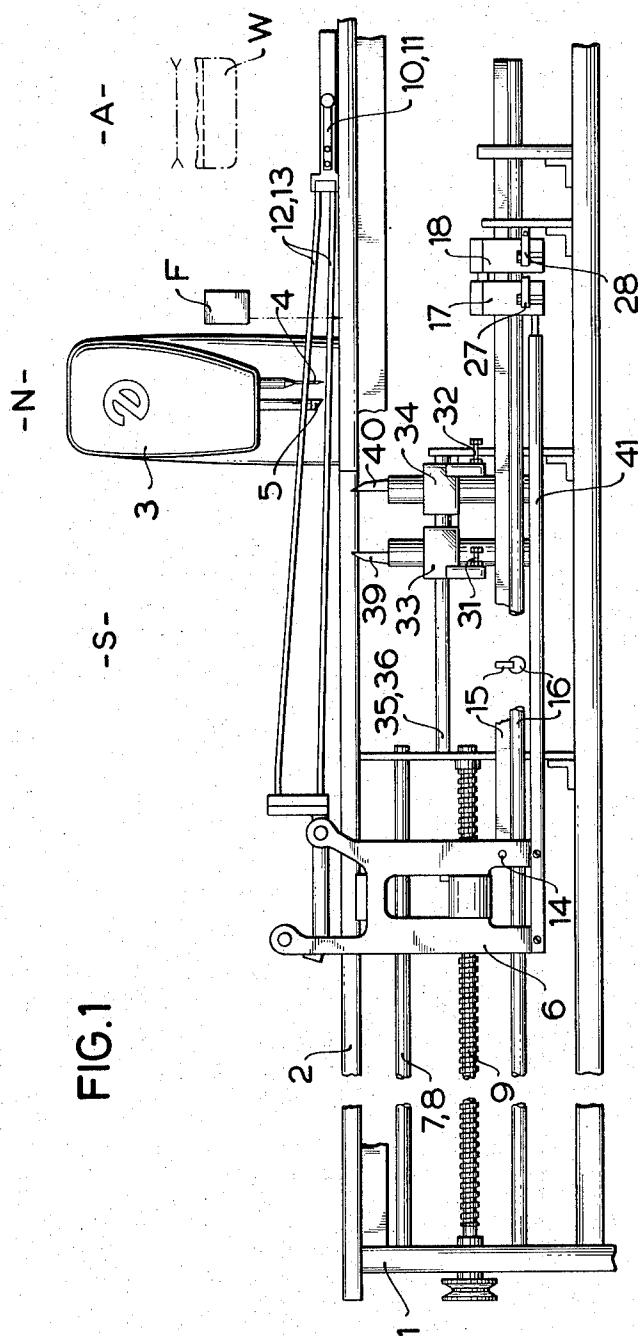


FIG. 4

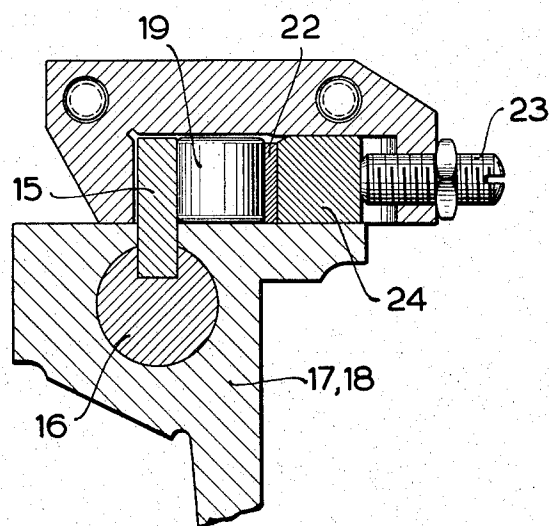
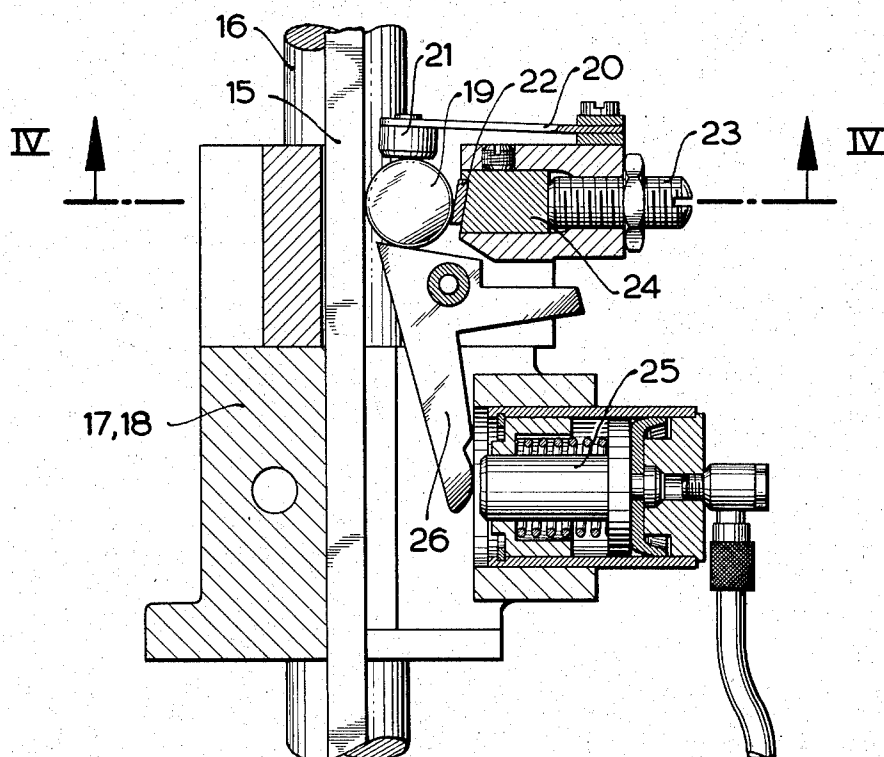


FIG. 3



SEWING APPARATUS FOR THE FORMATION OF EDGE-PIPING OPENINGS

SPECIFICATION

1. Cross-reference to Related Application

This application is related to my concurrently filed copending and commonly owned application Ser. No. 386495 entitled "Cutter Device For Use in Sewing Apparatus."

2. Field of the Invention

My present invention relates to an apparatus for the formation of pocket openings in a fabric workpiece and especially the formation of so-called straight or slash pockets in an outer garment wherein the pocket opening is edged with piping and the pocket slit is formed in the fabric workpiece and the piping, binder or edge-reinforcing strip as a pair of stitch seams are formed parallel to the pocket opening.

BACKGROUND OF THE INVENTION

In the commonly assigned application Ser. No. 244,781, filed Apr. 17, 1972 by myself, and an other, now U.S. Pat. No. 3,747,545, there is described a system for the formation of pocket openings in a fabric workpiece. In general, the apparatus comprises a work table upon which a sewing machine is mounted and having a pair of needles which are designed to stitch parallel rows of stitches through a piping strip or slit reinforcement juxtaposed with the fabric workpiece, and a blade between the needles for slitting the workpiece parallel to and between the stitch seams, thereby forming the main pocket slit.

In a so-called straight pocket, the two rows of stitches commence simultaneously and terminate simultaneously so that a generally rectangular pattern is formed by the stitch seams flanking the pocket slit. In many garments, however, a so-called slash or slant pocket is desired, whereby one of the needles commences its stitching operation before the other and terminates its stitching operation before the other so that the two rows of stitches are offset in a direction parallel to the direction of advance of the fabric and reinforcing strip through the sewing station. The resulting stitch pattern is that of a parallelogram having obtuse and acute angles instead of the right angles of rectangular pattern. The apparatus comprises a device for clamping a binder strip in juxtaposition with the workpiece fabric and fabric-transport means for advancing the workpiece and the reinforcing strip from a station upstream of the sewing machine on the work table to a downstream station.

The apparatus further comprises a pair of upwardly displaceable angular blades adapted to pierce the fabric and the binder strip subsequent to the formation of the main pocket slit so as to form a pair of oppositely open angular incisions at each end of the pocket slit. The angular incisions have legs extending from the edge of the pocket slit outwardly toward the end of a respective stitch seam.

While the system described in the aforementioned patent has proven to be generally effective and efficient because of the means provided for actuating the angular blades and controlling the starting and stopping of the individual needles, problems have been encountered because of variations in the length of the binder or reinforcing strip applied to the workpiece. Such length variations may arise from inaccuracies in cutting

of the strip, variations in the nature of the fabric, and the varying degree of stretching to which this strip is subjected in automatic machines of the class described.

- 5 Since a neat pocket opening depends upon the precise positioning of the angular cuts with respect to the ends of the pocket slit and the leading and trailing edges of the reinforcing strip, adjustment of the positions of the angular cutter has been required heretofore at frequent intervals in the production of pocket openings for garments and the like.

OBJECT OF THE INVENTION

It is the principal object of the present invention to provide an improved apparatus for the sewing and formation of pocket slits having edge piping or edge reinforcement whereby the aforementioned disadvantages are obviated.

It is another object of the invention to provide a system whereby, in the production of pocket slits between two rows of stitching with angular cuts at the termini of the main pocket slit, variations in appearance and configuration because of changes in the length of the binder strip are excluded.

Still another object of my invention is to provide an apparatus of the class described which represents an improvement over the system set forth in the aforementioned patent.

SUMMARY OF THE INVENTION

These objects and others which will be apparent hereinafter are attained, in accordance with the present invention, in an apparatus for the formation of a pocket slit in a fabric workpiece which comprises, as described in the aforementioned patent and the publications of record therein, a work table, a double-needle sewing machine disposed along this table for stitching a pair of parallel seams through the fabric workpiece and a pocket strip juxtaposed therewith, a blade disposed along the table and forming a pocket slit through the workpiece and a reinforcing strip between the stitch seam, a transport device engageable with the workpiece and the strip for advancing same along a path past the sewing machine and the blade, and a pair of angle cutters adapted to form angular incisions at each end of the pocket slit.

The present improvement resides in the provision of a respective cutter element shiftable parallel to this fabric-transport path and provided with each of the angle cutters, sensing means responsive to the leading edge of the strip upon displacement thereof for coupling a first one of these cutter elements with the fabric transport device and responsive to the trailing edge of the strip for coupling the other cutter element to the device whereby the two cutter elements are precisely positioned in dependence upon the leading and trailing edges of the binder strip. Means is provided for returning the angle-cutter elements to their original or starting positions.

Since the cutter elements are positioned at the location and with a spacing determined by the physical detection of the leading and trailing edges of the binder strip, variations in the length thereof do not cause unsightly or irregular appearances of the pocket formed by the apparatus. Of course, for the production of inclined pocket slits the machine may be provided with the systems for independently starting and stopping the

individual needles in the manner described in the aforementioned patent.

According to a further feature of the invention, the device comprises a slide carriage displaceable upon release of a support, e.g. via a reversible threaded spindle, and a drag rail upon which a pair of independently shiftable entrainers are slidably mounted for independent coupling to the carriage by the sensing device, and engageable with the respective angle-blade elements. The drag rail is preferably guided in a groove of a rail of the support while the independently actuatable coupling means of each entrainer comprises a spring-biased roll which is wedged into a gap between a shoe and a flank of the prismatic drag rail. A pivotal lever on each entrainer is displaceable by fluid-responsive means controlled by the sensing device for displacing the respective roll in the direction opposite that of convergence of the gap to release the respective entrainer.

DESCRIPTION OF THE DRAWING

The above and other objects, features and advantages of the present invention will become more readily apparent from the following description, reference being made to the accompanying drawing in which:

FIG. 1 is a simplified side-elevational view, partly broken away in the length, of the apparatus of the present invention showing only those portions relevant to the present improvement, the remainder of the apparatus including the needle control means being of the type described in the aforementioned patent;

FIG. 2 is a plan view of the apparatus shown in FIG. 1;

FIG. 3 is an enlarged cross-sectional view taken in a longitudinal plane and viewed from above, of a detail of the structure shown in FIGS. 1 and 2; and

FIG. 4 is a section taken along the line IV—IV of FIG. 3.

SPECIFIC DESCRIPTION

Since the invention relates to improvements in the formation of angular cuts at the ends of a pocket incision or slit formed between two rows of stitches by a two-needle sewing machine, the description below will concentrate on the relevant portions of this system and the remainder of the system may use structure and control devices which are not described but may be found in the abovementioned copending application, U.S. Pat. No. 3,747,545 and the prior published works of record therein.

The sewing apparatus comprises a framework or support 1 carrying a sewing or work table 2 upon which a two-needle sewing machine 3, of the type described in the abovementioned commonly owned patent, is mounted.

The two independently started and stopped needles 4 for producing parallel stitch seams which may have their starting and ending termini offset from one another in the formation of the pocket openings, are disposed at a stitching location N (FIGS. 1 and 2). A pocket-slitting blade 5 is effective between these rows of stitches in the conventional manner, parallel to the stitch rows.

The sewing machine 3 is operated and controlled between usual electric motor and needle-positioning mechanism operated by an electronic switching and control support (not shown here but described in the

forementioned patent) in dependence upon the movement and positioning of the fabric workpiece.

The workpiece-transport device comprises a slide carriage 6 displaceable by a threaded spindle 9 upon a pair of parallel horizontal rails 7, 8 fixedly mounted on the support 1. The spindle 9 is driven by a variable-speed reversible drive (not shown) from the aforementioned electric motor or another motor especially provided for this purpose.

Two workpiece clamps 10 and 11 are tied to the slide carriage 6 by rods 12 and 13 (FIGS. 1 and 2) and shift the workpiece from a location A at which the workpiece is disposed on the table 2 (as described in the aforementioned patent), repeatedly to the stitching location N. The workpiece is then displaced at a reduced speed through the stitching location N at which, with offset starting and stopping of the needles 4, the two parallel seams are formed and the pocket sleeve (parallel to and between the seams) is incised in the binder strip W and the fabric workpiece. The workpiece and binder strip are thus advanced to a cutting location S along the table at which the angular slits are cut at the ends of the pocket slit.

A dragrail 15 is affixed at 14 to the slide carriage 6 and is guided in a longitudinal groove of a fixed rail 16 mounted in the support 1 (FIGS. 3 and 4). The rail 16 passes through the carriage 6 which entrains the rail 15 therewith.

A pair of entrainment blocks (entrainers) 17 and 18, best seen in FIGS. 3 and 4, are relatively displaceable and shiftable mounted on the dragrail 15 while being individually lockable or couplable thereto by the mechanism illustrated in detail in FIGS. 3 and 4.

The coupling mechanism in each case comprises a clamping roll 19 urged by a leaf spring 20 and its pressure piece 21 in one longitudinal direction (well to the flank of the rail 15 against which it bears and opposite the direction of advance of the workpiece) in which a hardened metal shoe 22 (inclined to the rail flank in this direction) wedges the roll 19 against the flank.

The shoe 22 is carried by a block 24 slidable without play in a channel of the entrainer opening in the direction of the aforementioned flank of dragrail 15. A positioning screw 23, threaded into the entrainer body, is accessible from the exterior to adjust the position of the block 24 and hence the shoe 22 and can be locked by a nut. A set screw, also threaded into the upper member of the entrainer body, may lock the block 24 in position as shown in FIG. 4.

Decoupling of the entrainer 17 and 18 is effected by respective fluid-responsive pistons 25 which act against compression springs when fluid pressure is applied behind them (from the right in FIG. 3) to swing the respective bell crank levers 26 in the clockwise sense (FIG. 2) and displace the rolls 19 against the springs 20 in the direction opposite that in which the wedge shoe 22 converges toward the flank of the dragrail 15 engaged by the roll.

The entrainers 17 and 18 are held releasably in their end position (FIG. 2) by a pair of leaf springs 27 and 28 (forming detent means) whose V-shaped free extremities enter notches in the entrainer bodies.

While the entrainers 17 and 18 are otherwise identical, they differ in the position of respective engagement members 29 and 30 which lie in different vertical planes.

The engagement (abutment) members 29 and 30 respectively are engageable with abutments 31 and 32 adjustably provided or a pair of cutter elements 33 and 34.

The cutter elements 33 and 34 are slidably mounted upon two parallel guide rails 35 and 36 carried by the support 1. In their starting positions, the extreme downstream element 33 is held by a tension spring 37 against the upstream element 34 while the latter is retained by its extensible tension spring 38 against a stop plate fixed adjustably to the rails 35 and 36.

The rails 35 and 36 are parallel to the rails 7, 8, 15 and 16. The cutter elements 33 and 34 are respectively displaced to the left (FIG. 2) upon entrainment of their abutment members 31 and 32 respectively by the abutment members 29 and 30 of the entrainers 17 and 18, thereby stretching the springs 37 and 38.

Each cutter element 33 and 34 carries a vertically shiftable angle-cutting blade or blade assembly 39, 40 which is engageable with the fabric workpiece held upon the table 2 to incise the desired angle cuts at the end of the pocket incision. With this arrangement it is possible to achieve the requested exact positioning of the angle incision at locations which may vary because of changes in the length of the pocket strip.

In the starting position for each pocket-forming operation the slide carriage 6 is in its extreme right hand position (FIG. 2) in which its bar 41 has urged the entrainer 17 to the right and into engagement with its detent 27, the entrainer abutting the entrainer 18 which is held by its detent 28 and lies against a stop on the support 1. In this position as well the workpiece lamps 10 and 11 lie upstream of the needles 4 of the sewing machine 3 at the station A.

A pocket strip W is disposed at A in the clamp 10 and a workpiece (not shown) is placed under the clamps 10 and 11, being properly oriented by a marking-lamp arrangement (e.g. an optical sensor responsive to marks on the garment) as described in the aforementioned patent.

When the sewing machine is set in operation, the spindle 9 is driven at high speed in one sense to shift the slide 6, the clamps 10 and 11 and the dragrail 15 repeatedly to the left until the location of the workpiece at which the pocket is to start is upstream of the stitching location N. During this movement, the leading edge of the pocket strip W activates a photocell F whose output signal vents the fluid cylinder of entrainer 17 to permit its piston 25 to shift to the right (FIG. 3) so that spring 20 boases the roll 19 into the wedge-like gap between the shoe 22 and the flag of the dragrail 15. This couples the entrainer 17 with the dragrail 15 so that the entrainer is now also drawn to the left.

At the trailing end of the strip W, the photocell F is again stimulated to produce the output which causes release of pressure in entrainer 18 and permits the latter to lock on to the dragrail as described for the entrainer 17. The entrainers 17 and 18 are thus precisely spaced apart with respect to the leading and trailing edges of the strip W. Their abutments 29 and 30 have a spacing corresponding exactly to the length of the pocket strip W.

Sensing the position of the cutter elements 33 and 34 is synchronized with the workpiece and the pocket strip by the slide carriage 6, the positions of the stitched and incised pocket slit with respect to the two cutter elements 33 and 34 is correctly determined. Thus when

the slide carriage 6 resumes its extreme left hand position with the workpiece at station S, the blades 39 and 40 can be actuated, i.e., driven upwardly, by a mechanism such as a fluid cylinder, preferably of the type described in my concurrently filed copending application Ser. No. 386495 entitled "Cutter Device For Use in Sewing Apparatus."

The angle cutters or blades 39, 40 thus define angle incisions extending between ends of the pocket slit and the two stitch seams.

Upon formation of the angle incisions, the workpiece clamps 10 and 11 are released and the workpiece is removed and stacked, preferably by a mechanically operated device.

The slide carriage 6 is then shifted to the right to bring the clamps 10 and 11 again into the position A in which a fresh workpiece is engaged and a pocket strip provided.

The pistons 25 are actuated to shift the bell crank levers 26 in the clockwise sense and disengage the rolls 19 to release the respective entrainers 17, 18 on the drag rail 15 for movement relative to one another and to the drag rail. The spring load abutment bar 41 then engages the entrainers 17 and 18 to shift them to the right until they are held against the stops described (in their starting positions) and are engaged by the detents 27 and 28. The cutting elements 33 and 34, upon disengagement from their entrainers 17 and 18, are drawn by springs 37 and 38 into their starting positions.

While the cutter elements 33 and 34 may be mounted directly upon the slide carriage 6, e.g. on the drag rail 15, by coupling means similar to those described for the entrainers 17 and 18, it has been found to be desirable to use the entrainers 17 and 18 between the cutter elements and the drag rail since less complicated mechanisms are required for displacing the cutter elements and difficulties in locating the latter and spatial consideration make the indirect system described more practical.

I claim:

1. In an apparatus for the formation of a pocket slit in a fabric workpiece, comprising a work table, a double-needle sewing machine disposed along said table for stitching a pair of parallel seams through said workpiece and a pocket strip juxtaposed therewith, a blade disposed along said table for forming a pocket slit through said workpiece and said strip between said seams of a transport device engageable with said workpiece and said strip for advancing same along a path past said sewing machine and said blade, and a pair of angle cutters adapted to form angle incisions at each end of said pocket slit, the improvement which comprises:

respective cutter elements shiftable parallel to said path and each provided with one of said cutters; sensing means responsive to the leading edge of said strip upon displacement thereof for coupling a first of said cutter elements to said device for entrainment therewith from a starting position and responsive to the trailing edge of said strip for coupling a second of said cutter elements to said device for entrainment therewith from a starting position whereby said angle cutters are accurately positioned relative to said strip; and means for returning said elements to their respective starting positions.

2. The improvement defined in claim 1 wherein said device comprises a slide carriage, support means for guiding said carriage parallel to said path, a pair of entrainers slidably guided on said support means and respectively engageable with said elements for drawing same with said entrainers, and means on each of said entrainers responsive to said sensing means and releasably coupling same with said device.

3. The improvement defined in claim 2 wherein said device is provided with a drag rail extending parallel to said path, said entrainers being slidably mounted on said drag rail.

4. The improvement defined in claim 3 wherein said support means includes a main rail parallel to said path and provided with a longitudinal groove slidably receiving said drag rail.

5. The improvement defined in claim 3 wherein said support means includes a pair of auxiliary rails parallel to said path, said cutter elements being guided on said auxiliary rails, said means for returning said elements being tension springs respectively anchored to said elements.

6. The improvement defined in claim 3 wherein said

drag rail is prismatic and has a longitudinally extending flank, said means on each of said entrainers including a respective roll adjacent and engageable with said flank, a shoe defining with said flank a gap converging in the longitudinal direction, a spring urging said roll into said gap in said direction, a lever mounted on the entrainer and pivotal to urge said roll against said spring, and fluid-responsive means controlled by said sensing means for displacing said lever.

7. The improvement defined in claim 6 wherein said spring is a leaf spring having a pressure member bearing on said roll.

8. The improvement defined in claim 7 wherein said fluid-responsive means includes a spring biased piston bearing upon an arm of said lever.

9. The improvement defined in claim 8, further comprising detent means releasably retaining said entrainers in respective starting positions.

10. The improvement defined in claim 9 wherein said carriage is provided with a spring loaded pusher for urging said retainers into engagement with said detent means.

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