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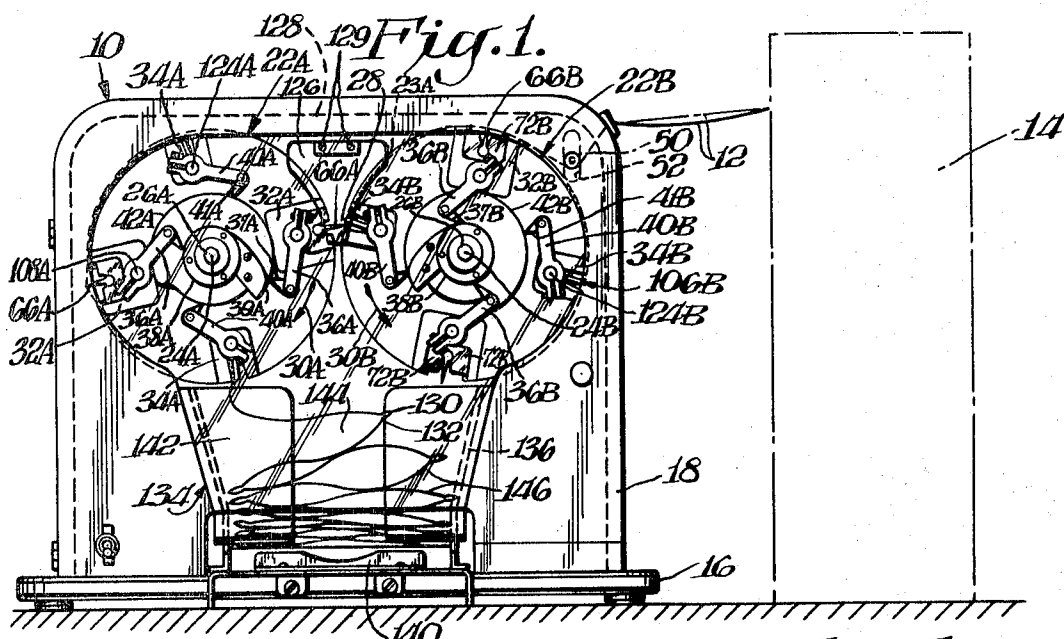
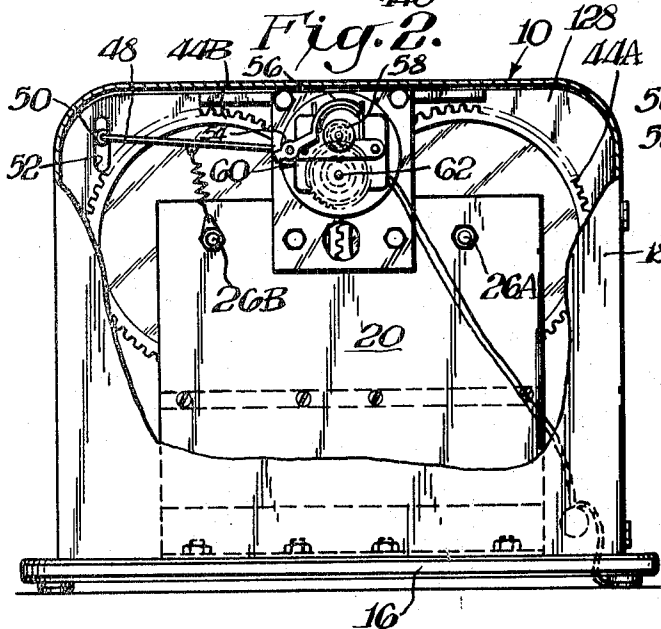
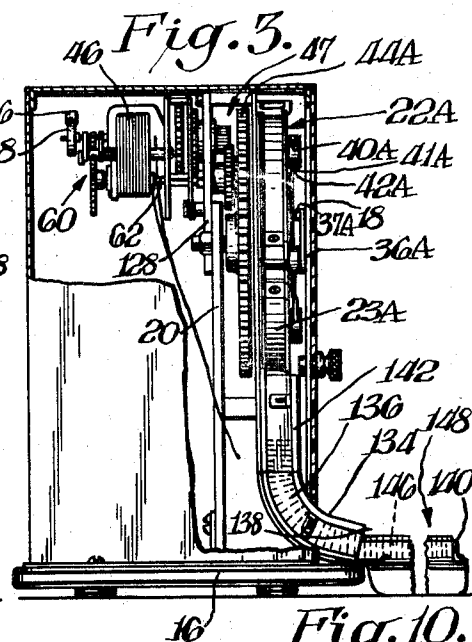
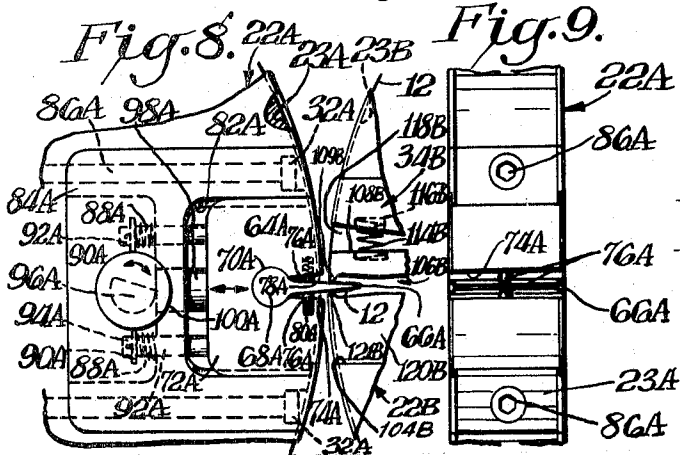
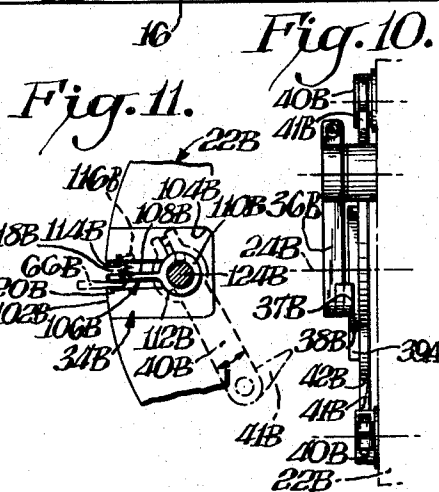
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3,528,651

TAPE-FOLDING DEVICE

Filed Sept. 11, 1967

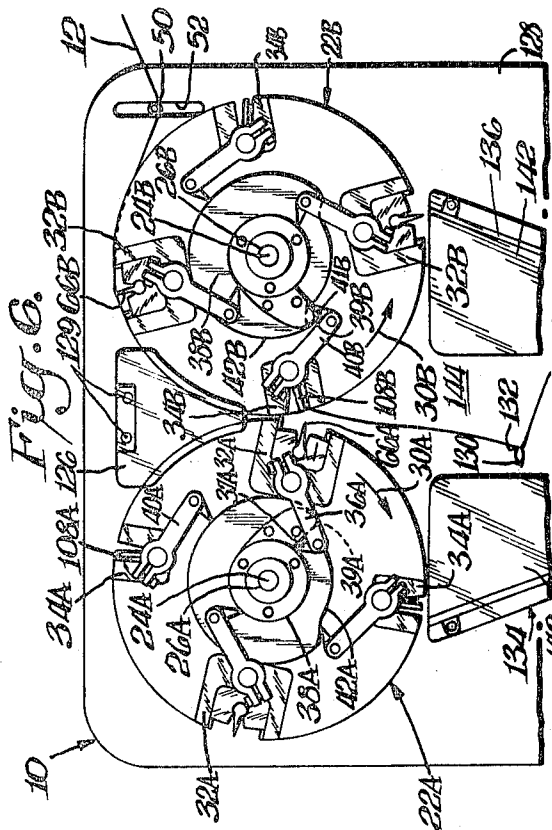
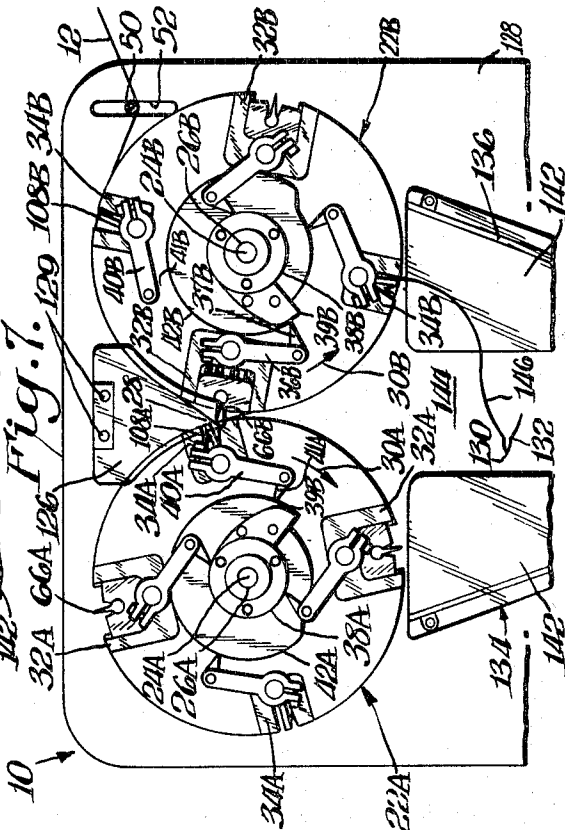
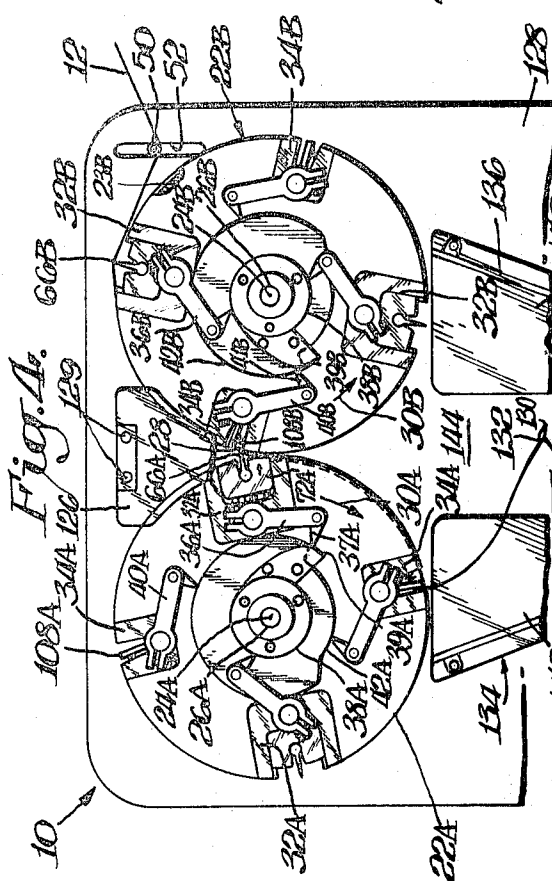
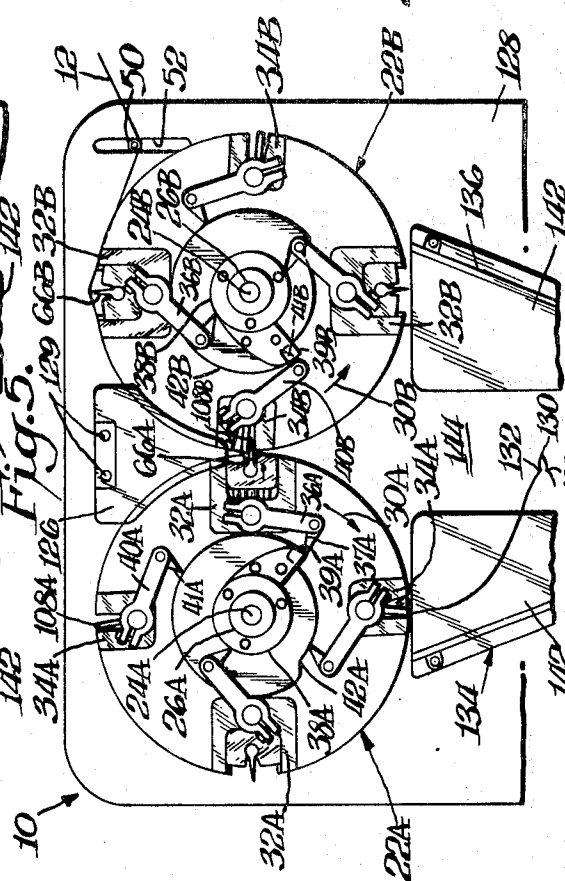
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TAPE-FOLDING DEVICE

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TAPE-FOLDING DEVICE

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Filed Sept. 11, 1967, Ser. No. 666,724

Int. Cl. B65h 45/16

U.S. Cl. 270—73

14 Claims

ABSTRACT OF THE DISCLOSURE

Tape is led into the nip between a pair of counter rotating wheels moving downwardly toward each other. In the nip it is tucked into successive jaws on alternate wheels by opposed tongues. The jaws and tongues are programmed to tuck the tape within the jaws which close at the nip. The jaws open just before they reach the bottom of the wheel and just after the next fold of tape is tucked into the following jaw on the opposite wheel. This folds the tape in zigzag fashion in a column below and between the bottom centers of the wheels. The jaw and tongue action is programmed by cams and followers. The tongues are slightly swivelled to prevent binding within the jaws. The front ends of the jaws have abutting projections to avoid pressing the vertices of the folds. This prevents the tape from being broken at the creased corners. The wheel drive is controlled by a slack detector, which may conveniently be provided by a brake upon an electric motor which is capable of stalling without damage.

BACKGROUND OF THE INVENTION

This invention relates to a device for folding tape. Information-bearing tape of the paper variety is used in the stock exchange and in stock brokers offices for recording stock quotations and sale prices. It is common practice to cut off and store portions of the tape relating to individual sales to provide a verifying record in the customers files. Pertinent sections of tape have heretofore been laboriously unraveled from the tangled mass of tape issuing from the teletypewriters and cut into individual lengths. These lengths are then wrapped into reels or flattened loops. Mechanical winding devices are used for winding the tape into these reels or flattened loops, but there is no available device for automatically folding the tape issuing from the teletypewriter into a neat column which can be readily scanned and separated.

An object of this invention is to provide a simple and dependable device for automatically folding tape into a neat and compact array.

Another object is to provide such a device for automatically folding tape issuing from a teletypewriter into a compact storage column which can be readily scanned.

SUMMARY

Tape is creased and folded for storage in a zigzag column by feeding it into the nip between a pair of counter rotating wheels moving downwardly toward each other. Opposed tongues and jaws alternately mounted about the peripheries of the wheels successively tuck the tape into jaws on alternate wheels. These jaws carry the creased folds or vertices of the tape to opposite sides of the storage column. The creased folds are released immediately after the following length of tap is grasped by a jaw on the opposing wheel. This creases successive lengths of tape in zigzag fashion and folds them into a neat column.

The tongues and jaws may be advantageously programmed to instantaneously thrust the tongues within the open jaws near the nip between the wheels. The tongues then close and after retraction of the tongues the jaws remain closed until near their bottom center of travel

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when they release just after the succeeding jaw on the other wheel grasps the next portion of tape to be creased. The tongue cam may advantageously be a quick-acting cam having an especially sharp retract curve. The jaw cam is more gradual but has substantially sharp clamping and releasing curves.

The drive is conveniently controlled by a tape slack detector, which causes the device to operate whenever tape is being fed into the device, such as from a teletypewriter.

This control is conveniently provided by an electric motor capable of stalling without damage and a brake which releases when slack tape is detected.

A particularly effective device includes two pairs of tongues and jaws mounted at 90° intervals upon each wheel and staggered 90° with respect to each other. Tongues and jaws of opposite orientation therefore successively engage each other at the nip of the wheels during their rotation. The tongues are slightly swivelled to prevent binding when inserted into opposite jaws. The jaws include abutting protrusions in their front ends to relieve pressure upon the vertices of the folds and thus prevent breakage at the folded corners.

BRIEF DESCRIPTION OF THE DRAWING

Novel features and advantages of the present invention will become apparent to one skilled in the art from a reading of the following description in conjunction with the accompanying drawings wherein similar reference characters refer to similar parts and in which:

FIG. 1 is a front view in elevation of one embodiment of this invention being fed with tape from a teletypewriter shown in phantom outline;

FIG. 2 is a rear view in elevation of the embodiment shown in FIG. 1 with a portion of the casing broken away;

FIG. 3 is a side view in elevation of the embodiment shown in FIGS. 1 and 2 with a portion of the casing broken away;

FIGS. 4-7 are front views in elevation of operative portions of the embodiment shown in FIGS. 1-3 in four successive phases of operation;

FIG. 8 is an enlarged view in elevation of operating features of tongue and jaw portions of the embodiment shown in FIGS. 1-7;

FIG. 9 is an end view of the tongue portion shown in FIG. 8;

FIG. 10 is an end view of cam and followers portions of the device shown in plan view in FIGS. 1 and 4-7; and

FIG. 11 is an enlarged plan view showing details of the jaw portion shown in FIGS. 1 and 4-8.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In FIG. 1 is shown tape folding and storing device 10 being fed with tape 12 from tape output device 14 shown in phantom outline. Device 14 represents any tape output device such as a teletypewriter. The solid representation of tape 12 illustrates the slack condition of the tape when it is issuing from teletypewriter 14, and the taut phantom representation of tape 12 illustrates the condition of tape 12 when all the slack is taken up by device 10 and no further tape is feeding from teletypewriter 14. Device 10 includes base 16 and casing 18. Operative portions of device 10 are mounted upon vertical support plate 20 shown in FIGS. 2 and 3.

The operative portions of device 10 include counter rotating wheels 22A and 22B mounted on parallel axes 24A and 24B provided by shafts 26A and 26B. Wheels 22A and B have their ends disposed close to each other to form a nip 28 between them. Wheels 22A and B rotate counter to each other in the directions of arrows 30A and 30B to move downwardly together at nip 28. Tape

12 is led over wheel 22B and carried downwardly into nip 28 within peripheral grooves 23A and B.

The tape is then folded by the programmed operation of tongue members 32A and B respectively mounted on wheels 22A and B in conjunction with jaw members 34A and B respectively mounted on wheels 22A and B. Tongues 32A and B alternate with jaws 34A and B about the peripheries of wheels 22A and B. They are also arranged to successively engage in alternate orientation at the nip between the wheels. In the illustrated embodiment having two tongues and two jaws arranged at 90° intervals, such engagement is accomplished by displacing tongues and jaws on respective wheels 90° out of phase with each other. This causes a tongue 32A on wheel 22A to engage a jaw 34B on wheel 22B (as shown in FIGS. 1 and 4) followed by an engagement of a tongue 32B on wheel 22B with a jaw 34A on wheel 22A (as shown in FIG. 7). This cycle is continuously repeated to cause the tape to be alternately grasped in the jaws of opposite wheels as later described in detail.

The cycle of operation of tongues 32A and B and jaws 34A and B is programmed by cams and followers. Followers 36A and B on tongue portions 32A and B engage cams 38A and B which are disposed in opposite hand relationship. Followers 40A and 40B on jaw portions 34A and B engage cams 42A and B which are also arranged in opposite hand relationship.

Wheels 22A and B are rotated by spur gears 44A and B secured to shafts 26A and B shown in FIGS. 2 and 3. Spur gears 44A and B are connected to the drive from electric motor 46 through compound gear train 47. The operation of electric motor 46 is controlled by lever 48 having a tape follower provided by roller 50. Roller 50 rides upon the length of tape 12 between output device 14 and the top of wheel 22B as shown in FIGS. 1 and 2. Roller 50 of lever 48 traverses up and down in slot 52 in face plate 128. Lever 48 is pivoted about axis 54 and is there attached to break lever 56 which rides upon brake drum 58 connected to motor 46.

Electric motor 46 is for example of the variety which may be stalled without damaging it. The characteristics of motor 46 and gear train 60 between brake drum 58 and drive shaft 62 of motor 46 cause it to be immediately stopped each time brake lever 56 engages brake drum 58. Motor 46 is operated to take up any slack which occurs in tape 12 as shown in the solid line representation of tape 12 shown in FIG. 1. When tape output device 14 stops feeding tape, it is drawn taut as shown in phantom outline to draw roller end 50 of lever 48 upwardly. This stops rotation of motor 46. Such operation may also be controlled by a on-off switch (not illustrated herein).

FIGS. 8, 9 and 11 illustrate details of tongue portion 32A and jaw portion 34B which are representative of all of the tongue and jaw portions in the device. In FIG. 8 is shown tongue portion 32A including tongue blade 66A connected to cylindrical root 68A. Root 68A swivels in cylindrical seat 70A in block 72A. Tapered entrance 74A to cylindrical seat 70A permits tongue blade 66A to rotate through a short arc substantially aligned with the peripheral movement of wheel 22A to prevent binding when it is engaged in jaw portion 34B. Blade 66A is resiliently centered within entrance of 74A by pistons 76A urged out of sockets 78A by coil springs 80A.

Tongue blocks 72A reciprocate back and forth in slot 82A in yoke 84A secured within the periphery of wheel 22A by cap screws 86A. Block 72A is resiliently retracted into slot 82A by coil springs 88A reacting against washers 90A connected to shafts 92A through pins 94A. Shafts 92A are secured to blocks 72A and are forced outwardly with it when cam 96A is in the position shown in FIG. 8 reacting against actuating shaft 98A connected to the center of the back of block 72A. Cam 96A is rotated by shaft 100A to which follower 36A is secured as shown in FIG. 1.

The details of jaw portion 34B are shown in FIGS. 8 and 11. Jaw portion 34B includes slotted jaw block 102B

mounted in a slot 104B in the periphery of wheel 22B. Movable jaw element 106B includes jaw blade 108B connected to cylindrical root 110B rotatably inserted within cylindrical socket 112B in jaw block 102B. Blade 108B is urged toward stationary jaw block 120B by coil spring 114B mounted within socket 116B in the opposite portion of jaw block 102B. Blade 108B moves back and forth within slot 118B in jaw block 102B. Jaw blade 108B is opened against the force of spring 114B by follower lever 40B secured to shaft 124B in common with root 110B of jaw element 106B.

OPERATION

The operating sequence of device 10 is illustrated in FIGS. 4-7. FIG. 4 shows a phase of operation similar to FIG. 1. In FIG. 4 tape 12 is being fed from output device 14 (shown in FIG. 1). This permits tape follower 50 to drop thereby lowering lever 48 shown in FIG. 2. This releases brake drum 58 from brake lever 56 allowing electric motor 46 to rotate. Wheels 22A and B therefore rotate downwardly towards each other along the direction of arrows 30A and 30B. Tape 12 in the nip 28 between wheels 22A and B is grasped between tongue member 32A and jaw member 34B which move into engagement at nip 28. The portion of tape 12 at nip 28 is tucked into jaw member 34B by tongue member 32A. Tape 12 is confined between the peripheries of wheels 22A and B by cover plate 126 secured to vertical face plate 128 by screws 129. In FIG. 4 tongue blade 66A is being inserted into engagement with jaw member 34B by insertion between movable jaw blade 108B and opposed stationary jaw 120B. Movable jaw blade 108B is being held away from stationary jaw 120B against the force of spring 116B by the position of follower lever 40B with its follower nose 41B contacting the high portion of cam 42B. At the same time tongue block 72A and tongue blade 66A are urged outwardly from wheel 22A by the position of follower lever 36A with its nose 37A upon peak 39A of cam 38A. This tucks a small loop of tape 12 between jaws 108B and 120B.

Rotation of wheels 22A and B from the position of FIG. 4 to that shown in FIG. 5 moves follower lever 40B about cam 42B a sufficient distance to cause follower nose 41B to drop into the lower portion 43B of cam 42B. This allows spring 114B to urge movable jaw 108B against stationary jaw 120B, which however are still separated by tongue blade 66A inserted between tucked loop of tape 12.

In FIG. 5 jaw member 34A just ahead of its bottom of travel is still grasping a creased portion of tape 12 between movable jaw 108B and stationary jaw 120B just prior to release. As shown in FIG. 8 and FIG. 11, the inserted portion of tape 12 is grasped between projection 109B on movable jaw 108B and projection 121B at the front of stationary jaw 120B to prevent crushing and breaking of the vertex 130 of tape 12 as shown at the bottom of FIG. 4. The pressure of the projections form indentations 132 spaced a short distance inwardly from vertices 130. This prevents fragile tape such as paper from being broken at the creased vertices. The slight arcuate freedom of tongue blade 66A permits the short amount of engaged movement within jaw member 34B illustrated in FIG. 4 and 5 without binding the wheels.

FIG. 6 shows a further phase of operation in which tongue member 32A has just passed nip 28 and retracted tongue blade 66A from jaw member 34B by dropping follower lever 36A downwardly past the straight side of peak 39A of cam 38A. This leaves the inserted loop of tape 12 grasped within movable jaw 108B and stationary jaw 120B of jaw member 34B. Some time between the positions of jaw member 34B shown in FIGS. 5 and 6 jaw member 34A has released folded tape vertex 130 near the bottom of wheel 22A toward the left side of storage column 134. Jaw member 34B at nip 28 then moves toward the right side of tape storage column 134.

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Storage column 134 includes a pair of side walls 136 having a tapered entrance and substantially straight lower portions as shown in FIG. 1. The bottom 138 of storage column 134 curves outwardly and horizontally toward retaining ledge 140. Tape 12 is loosely confined within storage column 134 by partial cover sections 142 with a substantial space 144 between them. Bottom 138 is free of side walls and cover plates to facilitate tape removal.

Tape 12 is thus stored within column 134 in a zigzag array by the alternate grasping, creasing and dropping of sections of tape 12 by jaws 34A and B on opposite wheels 22A and B. This is illustrated by the further phase of operation in FIG. 7 in which jaw 34B has moved downwardly from nip 28 close to the bottom of its travel in a position substantially opposite hand to jaw 34A at the bottom of wheel 22A shown in FIG. 5.

At the same time another set of tongue 32B and jaw 34A are engaging each other at nip 28 in a position substantially opposite side to that shown in FIG. 4. The section of tap 12 at nip 28 is engaged between tongue 32B and jaw member 34A. Jaw member 34B at the bottom of wheel 22B will release tape vertex 130 to drop the next fold into the right hand side of storage column 134. Successive lengths of tape 12 are thus creased and folded in zigzag fashion into storage column 134 with successive vertices of the folds dropping toward opposite sides 136. This provides a neat zigzag arrangement 146 of tape 12 within storage column 134 which can be readily scanned to separate and sever portions, such as those relating to individual stock transactions.

Tape output device 14 may apply suitable indicia such as distinct red marks at the beginnings and ends of the individual information items such as stock transactions. This provides a convenient guide to sever tape 12 at these points and abstracting the severed portions from the bottom end 138 of storage column 134 shown in FIG. 3. These portions have been automatically folded to provide neat and compact sections for convenient storage.

What is claimed is:

1. A device for creasing and folding tape comprising a pair of wheels having substantially parallel axes of rotation, the peripheries of said wheels being disposed closely adjacent to each other to form a nip therebetween, driving means connected to rotate said wheels counter to each other and toward each other from top to said nip, alternate jaw and tongue members disposed about said peripheries, programming means connected to said jaw and tongue members for causing successive engagement of opposing tongue and jaw members at said nip, means for guiding said tape over one of said wheels and between them into said nip whereby each of said tongue members thrusts said tape into said opposed jaw members at said nip to cause spaced portions of said tape to be alternately grasped within said jaw members on opposite wheels, a storage container disposed under and between said pair of wheels, and said programming means causing said jaw members to release said tape after the following jaw member grasps the following spaced portion of tape whereby said tape is creased and folded in a zigzag array in said container.

2. A device as set forth in claim 1 wherein said programming means comprises cam and follower means.

3. A device as set forth in claim 2 wherein said cam and follower means comprise cam means mounted about

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said axes, and said follower means is operatively connected to said jaw and said tongue members.

4. A device as set forth in claim 3 wherein said cam means for said tongue members comprise quick-acting cam means for thrusting into and retracting said tongue members from between said jaw members.

5. A device as set forth in claim 1 wherein control means is connected to said driving means for operating it when tape is being fed to said device, and said control means being constructed and arranged to operate said drive means when it detects slack in said tape in front of said nip.

6. A device as set forth in claim 5 wherein said control means comprises a slack detector riding in contact with said tape.

7. A device as set forth in claim 6 wherein said control device comprises an electric motor capable of stalling without damage and a brake, and said brake being connected to said slack detector for operation thereby.

8. A device as set forth in claim 1 wherein two of said tongue and two of said jaw members are disposed about said peripheries of each said circular means at 90° intervals.

9. A device as set forth in claim 1 wherein each of said jaw members comprise a stationary and a movable jaw, resilient means urging said jaws together, follower means connected to said movable jaw, and said follower means being constructed and arranged for rotating said movable jaw away from said stationary jaw for releasing said tape therefrom near the bottom of each of said wheels.

10. A device as set forth in claim 1 wherein the outer ends of each of said jaws include protrusions, and said tongue members being arranged to insert said tape past said protrusions whereby said jaws grip said tape a short distance away from its creased vertices to prevent the tape from being broken at said vertices.

11. A device as set forth in claim 1 wherein said tongue members have a slight swivelling movement whereby binding of said wheels is prevented when said tongue members are inserted within said jaw members.

12. A device as set forth in claim 11 wherein said jaw members comprise a support block reciprocally mounted within a radial socket in said wheels, a tongue blade having a cylindrical root, a cylindrical socket in said block for receiving said cylindrical root, which is inserted therein and the entrance to said cylindrical socket being outwardly tapered whereby said tongue blade is free to swivel a short distance relative to said block while it is inserted within said jaw member.

13. A device as set forth in claim 12 wherein resilient means maintains said tongue blade substantially radially aligned through the axis of said wheel.

14. A device as set forth in claim 1 wherein said jaw members and said programming means are constructed and arranged to release said tape near the bottom center of said wheels.

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