Nov. 11, 1958 P. H. ALLEN 2,859,961

FAN-FOLDING MACHINES

Filed June 18, 1951 2 Sheets-Sheet 1

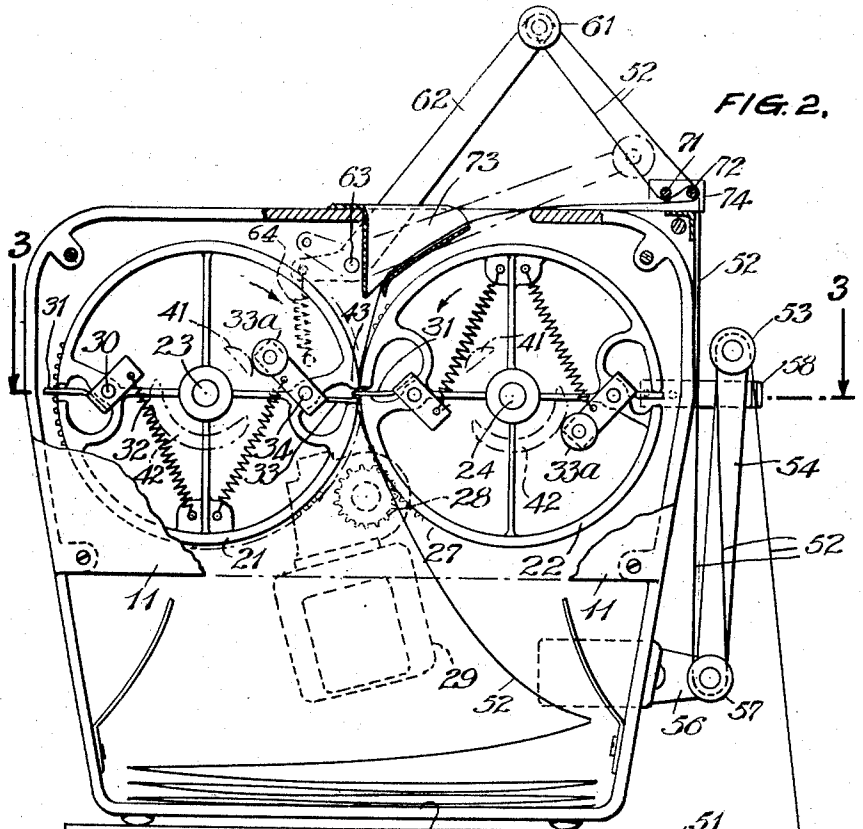

FIG. 2.

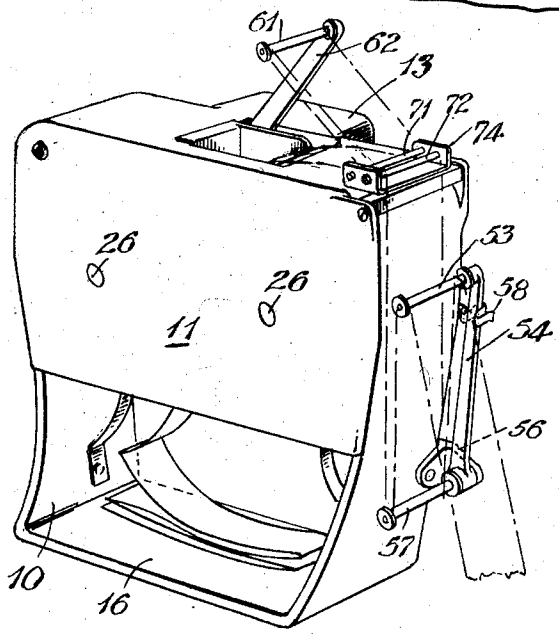

FIG. 1.

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FIG. 3.

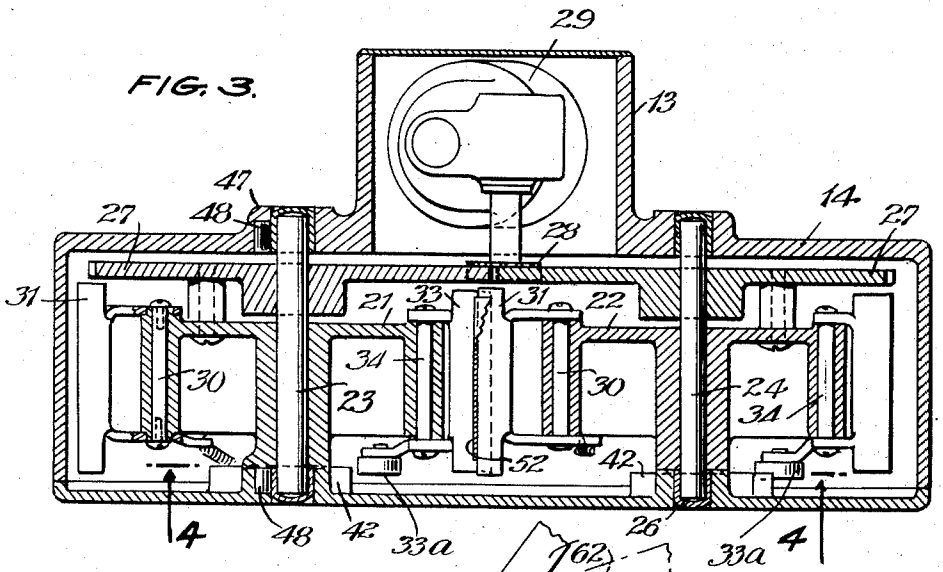


FIG. 4.

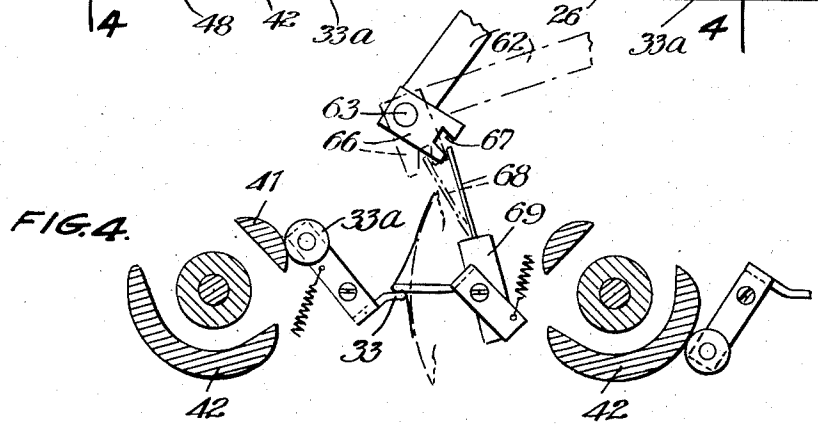
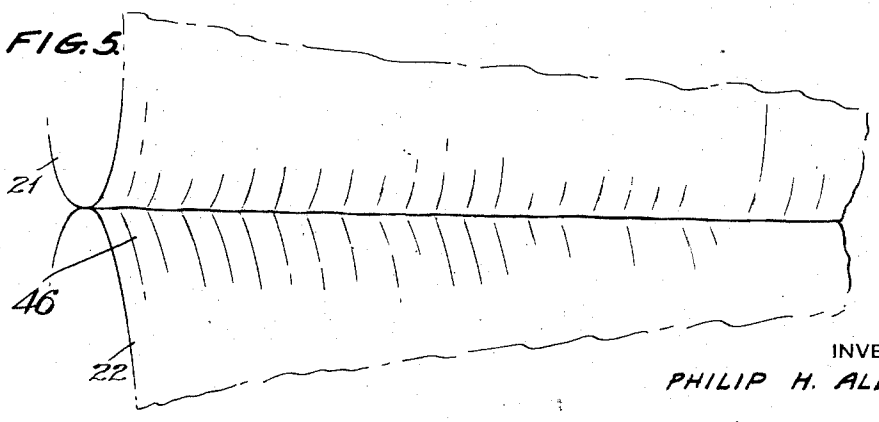


FIG. 5.



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2,859,961

FAN-FOLDING MACHINES

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Application June 18, 1951, Serial No. 232,189

4 Claims. (Cl. 270—73)

The present invention relates to the handling of paper in tape form where it is desirable to prepare the paper by fan-folding for handling and storage.

It is the general object of the invention to provide an improved fan-folding machine.

It is another general object of the invention to provide an improved fan-folding machine in combination with a tape dispensing machine such as a check proof machine, an automatic typewriter, or a teletype machine.

Another object of the invention is to provide a fan-folding machine which operates automatically in response to an intermittent feeding of the tape.

It is another object of the invention to provide an improved tape feed in a fan-folding machine.

Other objects and advantages will be apparent from the following description of a preferred embodiment of the invention, as illustrated in the accompanying drawings, in which:

Figure 1 is a perspective view of a tape fan-folding machine embodying the invention.

Figure 2 is a front elevational view with the cover plate removed, and certain parts showing in section.

Figure 3 is a horizontal sectional view on the line 3—3 in Figure 2.

Figure 4 is a fragmentary sectional view taken as indicated by the line 4—4 in Figure 3.

Figure 5 is a fragmentary perspective view of two paper feeding drums or reels of the machine.

Referring to Figures 1 and 2 the machine includes a cast main frame 10, having a cover plate 11 secured thereto and a motor housing 13, formed integrally with a back wall 14. The main frame 10 provides a storage shelf 16 for the fan-folded tape and serves with the cover plate 11 as a mounting for the two folding drums 21 and 22 referred to in detail hereinafter.

The two drums 21 and 22 are secured on respective shafts 23 and 24 journaled in suitable bearings 26, respectively in the rear wall 14 and the front plate 11 of the machine. The shafts 23 and 24 have mounted thereon intermeshing gears 27, one of which meshes with the drive pinion 28 of a suitable electric motor 29. The gearing is such that the two drums 21 and 22 rotate in the direction indicated by the arrows in Figure 2. Each drum has a tucking blade 31 suitably pivoted therein at 30 and spring-urged by a spring 32 for clockwise movement and also a creasing blade 33 suitably pivoted therein at 34 and urged counter-clockwise by a spring 36. The two blades of each drum are mounted 180° apart and the drums are so disposed that the tucking blade on one drum mates with the creasing blade on the other as shown in Figure 2. This specific form of fan-fold mechanism is shown in the patent to Campbell 1,959,409 dated May 22, 1934.

To control opening and closing of the creasing blade during rotation of the associated drum the cover plate 11 is provided with the respective cams 41 and 42 which serve to rock the creasing blade clockwise in each instance to a separate position. The cam 41 is immediately

ahead of the creasing position and serves to open a space between the creasing blade 33 and the opposed wall 43 against which it folds the tape, so that associated tucking blade can insert the tape for folding.

Each cam 42 operates on the associated creasing blade 33 through its roller 33a to open the creasing blade after it has creased the tape and to maintain it open during subsequent rotation of the drum until the creasing blade 33 of the opposite drum has in turn gripped the paper to make a fold. This insures withdrawal of the previous fold from between the creasing blade and the opposed wall of the drum, and eliminates any tendency of the tape to wind about a drum.

In order to insure effective feeding of the tape, the drums 21 and 22 (Figure 5) are provided with a transverse series of mating peripheral corrugations 46 and are urged together resiliently. As seen in Figure 4 the sleeve bearings 26 for the shaft 23 have a limited freedom in their mounting bosses 47. Adjacent each end of the shaft 23 there is a recess which receives a resilient cylindrical insert 48, such as synthetic rubber. One side of the insert 48 engages the bearing 26 for the shaft 23 and is compressed slightly thereby, so that the drum 21 is resiliently urged against the drum 22.

As shown in Figure 2, the fan folder is supported on top of a check proof machine 51 of the type shown in the patent to Brand et al., No. 2,146,695. See also Fuller, 1,966,623. This proof machine incorporates a step-by-step paper feed of conventional type for a roll of tape 52 on which it produces indicia. The conventional paper feed of the patent to Fuller 1,966,623 is indicated schematically in Figure 2 where the parts are given the same reference numerals as appear in the Fuller patent, particularly Figure 36 thereof. This paper feed means includes a supply roll 360 from which the paper strip 52 may be withdrawn, and a platen roller 350, which cooperates with a type wheel 341. From the platen roller 350 the strip 52 extends upwardly between a pair of feed rollers 364 and 365, the roller 364 carrying a ratchet wheel 367 adapted for operation by a pawl 368 to effect a step-by-step paper feed, and thereby release tape for fan-folding. From the paper feed means of the proof machine, the tape extends upwardly to an idler roll 53 of the fan folder at the upper end of arm 54 pivoted on a bracket 56 and carrying a second roll 57 coaxially with its pivot. The arm 54 is releasably held in the upright position shown by a spring latch 58. From the lower idler roll 57 the tape 52 extends upwardly and around a roll 61 at the upper end of a motor switch control arm 62 pivoted in the frame at 63 and urged counter-clockwise by a spring 64. The pivot shaft 63 (Figure 4) for the arm 62 carries an insulated switch control arm 66 having a slot 67 at its end which engages the switch arm 68 of a conventional toggle-type snap switch 69. The slot 67 provides for certain over travel of the arm 66 with respect to the switch, after tripping in one direction of movement or the other, so that there is a limited amount of lost motion of the arms 66 and 62 in the control of the switch. From the idler roll 61 the tape 52 extends under a rod or roller 71 and over a second rod or roller 72 and then along the top of the frame 10 and down a guide chute 73 to the folding drums 21 and 22. The small rolls 71 and 72 are suitably journaled in a bracket 74, and serve to take the curvature or set out of the tape, which has been rolled in a tight roll.

In operation the tape 52 is threaded over the various rolls as shown in Figure 2. The arm 54 provides an extra length of tape outside the fan folder sufficient in length for checking when in use with a check proof machine. By releasing the arm 54 from the latch 58 and with the motor off, the number of items printed on the

tape in this length of tape will correspond to the tape from previous pocket sort of the proof machine, so they can be placed side-by-side to check differences.

During operation, with the conventional motor switch on, the fan folder turns itself off and on by using the automatic switch **68** in response to the supply of tape to be folded. When no feed of tape is coming from the proof machine, the arm **62** is moved down to its dotted line position in Figure 2 by virtue of the tape being fed through the drums **21** and **22**, until the switch **69** is set to its off position. As the arm **62** moves upwardly under the influence of spring **64** step-by-step as the tape is fed step-by-step from the proof machine, the lost motion between the switch arm **68** and the slot **67** is gradually taken up, and slightly ahead of its full line position, the arm **62** will move the switch arm **68** to its open position. In practice, with the proof machine working steadily, the fan folder will actually be in operation about one-seventh of the time.

While I have shown and described the preferred embodiment of the invention it is apparent that it is capable of variation and modification from the form shown, so that its scope should be limited only by the scope of the claims appended hereto.

I claim:

1. In a tape fan-folding machine, fan-folding means for receiving tape, a motor for driving said fan-folding means, a spring-urged arm carrying a roll over which the tape is fed to the fan-folding means, said arm being urged by said spring to a first position and being responsive to increased tension of the tape to move against the urge of the spring toward a second position, a switch controlled by said arm and controlling said motor, said switch being conditioned to interrupt operation of the motor when said arm is in said second position and being conditioned to cause operation of said motor when said arm is in said first position, and a lost motion connection between said arm and said switch.

2. In a tape handling machine, means for receiving tape, a motor for said tape receiving means, a spring-urged arm carrying a roll over which the tape is fed to the tape receiving means, said arm being urged by said spring to a first position and being responsive to increased tension of the tape to move against the urge of the spring toward a second position, a switch controlled by said arm and controlling said motor, said switch being conditioned to interrupt operation of the motor when said arm is in said second position and being conditioned to cause operation of said motor when said arm is in said first position, and a lost-motion connection between said arm and said switch.

3. The combination with a machine for producing indicia on tape and having a step-by-step tape feed, of a motor-driven tape fan-folding mechanism including a motor control arm subject to the tension of the tape, and means responsive to movement of said arm for starting and stopping operation of the fan-folding mechanism.

4. The combination with a machine for producing indicia on tape and having a tape feed means, of a motor-driven tape fan-folding mechanism including a member subject to the tension of the tape, and means responsive to movement of said member for starting and stopping operation of the fan-folding mechanism.

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