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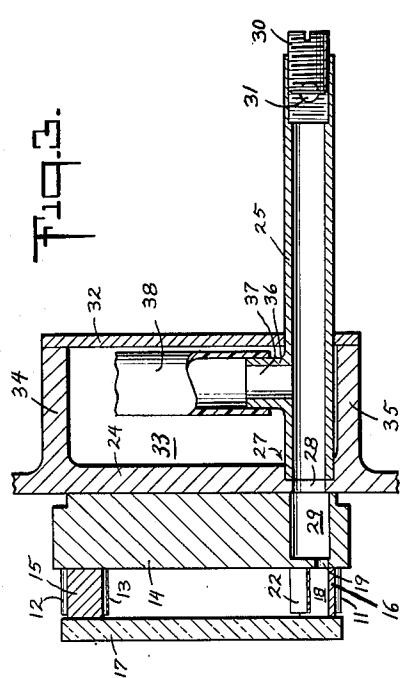
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3,258,183

TUNABLE TAPE VELOCITY-FLUCTUATION DAMPER

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2 Sheets-Sheet 1



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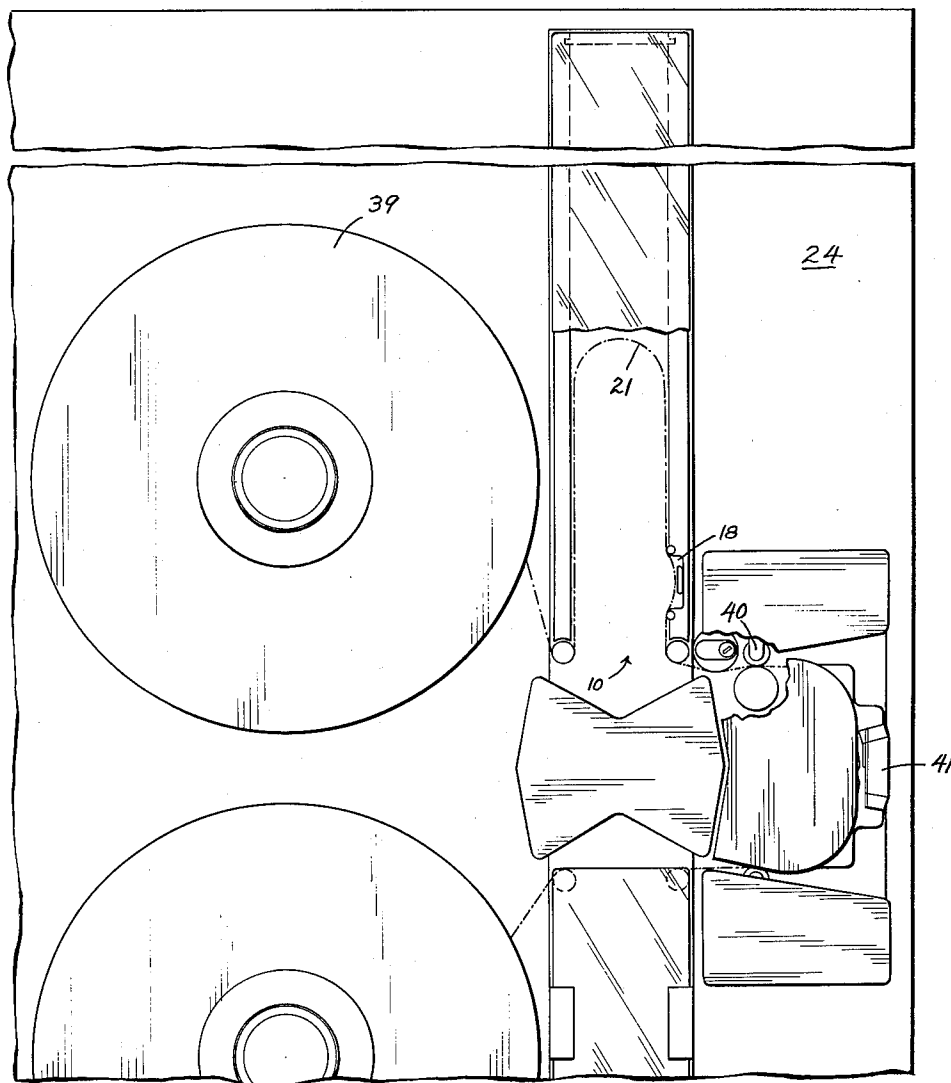
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2 Sheets-Sheet 2

Fig. 4



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1

2

3,258,183 TUNABLE TAPE VELOCITY-FLUCTUATION DAMPER

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This invention, generally, relates to information processing apparatus and, more particularly, to a tunable damper means for improving tape velocity-fluctuation performance in such apparatus.

It has been found that a means to develop a slight depression, or indentation, or pucker in an elongated web functions effectively as a damper for small variations in velocity due, primarily, to variations in web tension during a rapid start in web motion.

A principal object of this invention is to provide further improvement in the starting characteristics of a web, such as magnetic tape, on which information is processed.

Briefly, the invention contemplates an adjustable means connected with the vacuum connection for a small vacuum recess to adjust the magnitude of the vacuum pull.

The invention will be understood more fully from the following description of a preferred form referring to the accompanying drawings, in which:

FIG. 1 is a front view of a vacuum tape loop tank showing a smaller vacuum recess in one side thereof;

FIG. 2 is a view in cross-section of a part of the vacuum tank shown in FIG. 1;

FIG. 3 is a view in cross-section taken along the line 3-3 in FIG. 2; and

FIG. 4 is a front view of part of a panel showing principal component parts of a tape handler apparatus.

Referring now to FIG. 1 of the drawings, a vacuum tank is identified generally by the numeral 10 and is provided with either rollers or pins 11 and 12 to guide a tape 13 into and out of the tank 10 as desired.

The vacuum tank 10 is formed with a back 14, side strips 15 and 16, and a front cover 17. If desired, the front cover 17 may be of clear glass or plastic. A plurality of vacuum ports 10a and a single vacuum port 10b spaced from the plurality connect the tank 10 to a suitable vacuum source (not shown).

A recess 18 is formed in the side strip 16 and is provided with a port 19 connecting with a suitable vacuum source so that a relatively small pucker 20 is developed in the side of the tape loop 21. Pins 22 and 23 of highly-polished material are positioned adjacent opposite edges of the recess 18 to support the tape as it develops the pucker 20.

It should be noted in the drawing that the center of curvature for the pucker 20 is located on the opposite side of the path of the tape 13 along the side strip 16. This permits maximum effectiveness of the pucker 20 in damping tensions in the tape caused by fluctuations in velocity.

In FIG. 2, it may be seen that the front cover 17 fits snugly on the side strip 15, and a similar fit is provided between the cover 17 and the opposite side strip 16. The roller or pin 12 shows that the tape 13 is directed up and over the side strip 15.

The back 14 of the vacuum tank 10 is affixed to and supported directly on the panel 24 of a tape handler apparatus, and a tube 25 is seen to extend back beyond a vacuum chamber 26.

As better seen in FIG. 3, the tube 25 is fitted snugly into an opening 27 in the back of the panel 24. An opening 28 communicates the tubing 25 through the panel 24 into an opening 29 in the back 14, and the port 19 communicates between the recess 18 and the opening 29.

The opposite end of the tube 25 from the opening 28 is threaded to receive a plug 30. The threads are extended past a side opening 31 in the tube 25 so that the plug 30 is adjustable in position for controlling the area of the opening 31.

A plate 32 has an opening to fit over the tube 25 permitting the plate 32 to define a vacuum chamber 33 along with the panel 24 and sides 34 and 35. A hub 36 extends laterally from the tube 25 into the vacuum chamber 33 and is provided with a central opening 37 for communicating the vacuum in the chamber 33 to the hollow tube 25.

However, in accordance with the present invention, a coupling tube 38 is attached to the hub 36 to extend into the chamber 33 for a predetermined length, which is approximately one-eighth of the wave length of the particular frequency sought to be eliminated from the tape fluctuation during the start cycle. This coupling 38 forms a restriction between the opening 37 and the vacuum chamber 33.

In FIG. 4 a tape reel 39 provides a first, relatively high inertia storage means for a supply tape on a panel 24 of a tape handler apparatus. From this first storage, the tape passes into a loop 21 in a vacuum tank 10 to serve as a second, temporary, intermediate inertia tape storage means. The small recess 18 serves as a third, temporary, relatively low tape storage means for a tape loop, and a suitable pinch roller mechanism 40 is positioned next to an information processing station 41 for moving tape in information transferring relationship relative thereto.

The elements 39, 10, 18 and 40 will be used to move tape in one direction, but corresponding elements usually are provided also on the panel 24 so that tape may be moved back and forth past the station 41. Of course, it will be understood that other tape storage means than reels may be used, such as multiple fold tanks for example.

Some of the advantages of the tunable tape velocity-fluctuation damper of the present invention are that it provides an adjustable device which greatly reduces shock waves generated along the tape immediately after start of tape motion; reduces the time required for tape speed stabilization after start of tape motion; and permits individual machines to be adjustable for optimum performance by compensating for small differences in parts, vacuum readings, tape weight, etc. To obtain these advantages, it is necessary first to determine the wave length of the frequency caused by tape stretch during start cycle. This is done by any suitable and well-known means, the most customary being a direct oscilloscope reading.

It has been found that the frequency of this tape velocity-fluctuation is approximately one kilocycle.

As has been mentioned previously, the length measured from the outer opening of the coupling 38 to the tube 25 should be approximately one-eighth of the wave length for this one kilocycle frequency. The distance measured from the opening 31 in the tube 25 to the port 19 should be approximately one-half the wave length of the frequency sought to be eliminated from the tape.

While any suitable inside diameter may be provided for the tube 25 so long as it is sufficient to absorb enough energy to damp the particular frequency which is to be eliminated, it has been found that approximately three-eighths inch constant diameter provides satisfactory results. Also, while the particular angular configuration of the tube 25 relative to the opening 28 and the hub 36 may be varied for structure convenience on the back of a panel 24, it would not be desirable to cause too abrupt a bend since this would interrupt the tuning capacity of the tube 25 by introducing resistance.

The plug 30 is turned to adjust or tune the amount of air drawn in through the opening 31 relative to that drawn

3

in through the port 19 for passing through the hub 36 into the vacuum chamber 33, and it has been found that by proper tuning, the shock waves due to tape stretch during starting can be effectively eliminated.

The following claims are intended to define the valid scope of this invention over the prior art and to cover all changes and modifications falling within the true separate and valid scope of the invention.

While a vacuum tank 10 is shown as the means for developing a temporary storage for the loop 21, it will be apparent that any suitable loop-developing device may be used, such as a multiple loop tension arm for example. It is important, however, that the vacuum recess 18 be positioned adjacent the information transferring station 41, as shown in FIG. 4.

What is claimed is:

1. In a high speed tape handler apparatus comprising, first tape storage means for storing a predetermined length of tape,
- an information processing station including means to move tape from the first tape storage means in information transferring relationship relative to the information processing station,
- second tape storage means for temporarily storing a loop of tape between the first tape storage means and the information processing station,
- tape damper means between the second tape storage means and the information processing station for temporarily forming a pucker of tape including connection means for connecting a vacuum source to the tape damper means, and
- said damper means for dampening variations in tape tension, comprising:
 - means to develop a pucker in said tape when a vacuum source is connected to said connection means,
 - tunable vacuum chamber means adjacent the pucker forming means and connected to the vacuum connection means for adjusting the magnitude of the vacuum pull so that oscillations developed in the air in said vacuum chamber are tuned to resonate at a frequency that will dampen and minimize tape fluctuations developed by variations in tape tension during a change in motion characteristics of the tape.
2. In a high speed tape handler apparatus as set forth in claim 1 wherein the first tape storage means is a reel including rotatable support means therefor.
3. In a high speed tape handler apparatus as set forth in claim 1 wherein the second tape storage means includes a vacuum tank.
4. In a high speed tape handler apparatus as set forth in claim 1 wherein the first tape storage means is a reel including rotatable support means therefor, and the second tape storage means includes a vacuum tank.
5. In a high speed tape handler apparatus comprising, first tape storage means for storing a predetermined length of tape,
- an information processing station including means to move tape from the first tape storage means in information transferring relationship relative to the information processing station,
- second tape storage means for temporarily storing a loop of tape between the first tape storage means and the information processing station,
- tape damper means between the second tape storage means and the information processing station for temporarily forming a pucker of tape including connection means for connecting a vacuum source to the tape damper means, and
- said damper means for dampening variations in tape tension, comprising:
 - means to develop a pucker in said tape when a vacuum source is connected to said connection means,
 - means to define a vacuum chamber having an adjustable opening to permit the magnitude of the vacuum pull at the vacuum connection means to be varied for

4

tuning said vacuum chamber to dampen variations in tape tension during a change in motion characteristics of the tape.

6. In a high speed tape handler apparatus as set forth in claim 5 wherein the first tape storage means is a reel including rotatable support means therefor.

7. In a high speed tape handler apparatus as set forth in claim 5 wherein the second tape storage means includes a vacuum tank.

8. In a high speed tape handler apparatus as set forth in claim 5 wherein the first tape storage means is a reel including rotatable support means therefor, and the second tape storage means includes a vacuum tank.

9. In a high speed handler apparatus comprising, first tape storage means for storing a predetermined length of tape,
- an information processing station including means to move tape from the first tape storage means in information transferring relationship relative to the information processing station,
- second tape storage means for temporarily storing a loop of tape between the first tape storage means and the information processing station,
- tape damper means between the second tape storage means and the information processing station for temporarily forming a loop of tape including vacuum connection means for connecting a vacuum source to the tape damper means, and
- said damper means for dampening variations in tape tension, comprising:
 - means to develop a pucker in said tape when a vacuum source is connected to said connection means,
 - a tube connected between the means to develop a pucker and the vacuum connection means including an extension at an angle to the vacuum connection means,
 - the end of the extension being formed with a plurality of threads past an opening, and
 - a threaded plug to be adjustable in position in the threads relative to the opening for tuning the vacuum pull at means to develop a pucker to dampen variations in tape tension during a change in motion characteristics of the tape.
10. In a high speed tape handler apparatus as set forth in claim 9 including restrictive tubing connected with the extension for coupling the tube with the vacuum connection means.
11. In a high speed tape handler apparatus as set forth in claim 9 wherein the first tape storage means is a reel including rotatable support means therefor.
12. In a high speed tape handler apparatus as set forth in claim 9 wherein the second tape storage means includes a vacuum tank.
13. In a high speed tape handler apparatus as set forth in claim 9 wherein the first tape storage means is a reel including rotatable support means therefor, and the second tape storage means includes a vacuum tank.
14. In a high speed tape handler apparatus for processing information on an elongated magnetic tape, comprising
 - first and second tape storage means for storing a predetermined length of magnetic tape,
 - an information processing station including means to move the predetermined length of magnetic tape back and forth between the first and second tape storage means in information transferring relationship relative to the information processing station,
 - third and fourth tape storage means for temporarily storing a loop of tape respectively between the first storage means and the information transferring station and between the second storage means and the information transferring station, and
 - tape damper means for dampening variations in tape tension between said third tape storage means and the information transferring station and between said

5

fourth tape storage means and the information transferring station, each damper means comprising: at least one relatively small vacuum recess positioned adjacent the information transferring station to develop a low inertia pucker in the tape, and means to define a vacuum chamber connected with the vacuum connection means for adjusting the magnitude of the vacuum pull so that oscillations developed in the air in said vacuum chamber are tuned to resonate at a frequency that will dampen and minimize tape fluctuations developed by variations in tape tension during a change in motion characteristics of the tape.

15. In a high speed tape handler apparatus for processing information on an elongated magnetic tape, comprising

high inertia tape storage means for storing a predetermined length of magnetic tape, an information processing station including means to move the predetermined length of magnetic tape from the high inertia storage means in information transferring relationship relative to the information processing station, intermediate inertia tape storage means for temporarily storing a loop of tape between the high inertia storage means and the information processing station, and

6

tape damper means for dampening variations in tape tension between said third tape storage means and the information transferring station and between said fourth tape storage means and the information transferring station, each damper means comprising: low inertia vacuum recess means positioned adjacent the information transferring station to develop a pucker in the tape, and

means to define a vacuum chamber connected with the vacuum connection means for tuning the pull of vacuum by adjusting the magnitude of the vacuum pull so that oscillations developed in the air in said vacuum chamber are tuned to resonate at a frequency that will dampen and minimize tape fluctuations developed by variations in tape tension during a change in motion characteristics of the tape.

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