United States Patent

[11] 3,570,737

[72] Inventor **Herbert F. Sanford**
Littleton, Colo.

[21] Appl. No. **773,224**
[22] Filed **Nov. 4, 1968**
[45] Patented **Mar. 16, 1971**
[73] Assignee **Honeywell Inc.**
Minneapolis, Minn.

[54] **MOUNTING ARRANGEMENT**
8 Claims, 3 Drawing Figs.

[52] **U.S. Cl.** **226/188,** 226/200, 248/18
[51] **Int. Cl.** **B65h 17/20**
[50] **Field of Search** 248/18, 21, 22; 226/188, 190, 194, 200

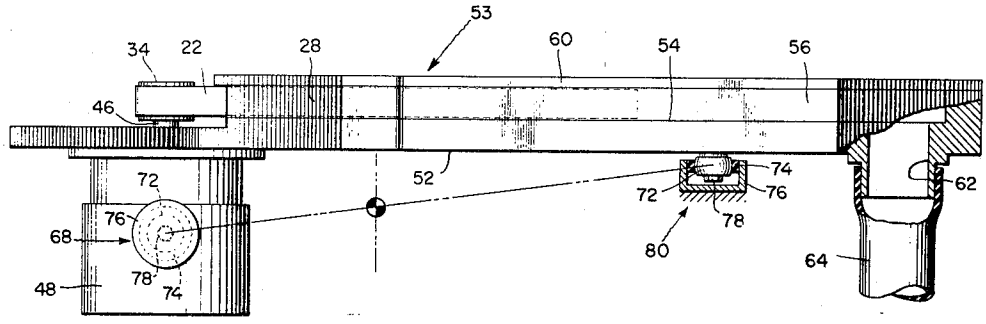
[56] **References Cited**

UNITED STATES PATENTS

2,270,335	1/1942	Parkinson	248/21
3,425,652	2/1969	Leary	248/22

Primary Examiner—Richard A. Schacher
Attorney—Arthur H. Swanson & Lockwood D. Burton

ABSTRACT: A web drive mounting arrangement is shown for isolating the web drive from shock and vibration and the stress caused thereby having a plate mounted within a main frame. A driving motor is mounted on the drive plate for driving a capstan which drives a web across a web contacting surface thereof. First and second spherical self-aligning bearings extend from the driving motor and are rotationally mounted upon the main frame. A third bearing is mounted between the plate and the main frame. The plane formed by the three bearings passes through the center of gravity of the web driving arrangement, while the third bearing mounts at the center of percussion of the web driving arrangement. This mounting arrangement thereby prevents vibrational forces parallel to the web contacting surface from causing deflections of that surface and causes vibrational forces perpendicular to the web contacting surface to produce a rotational motion about the first and second bearings attached to the driving motor.



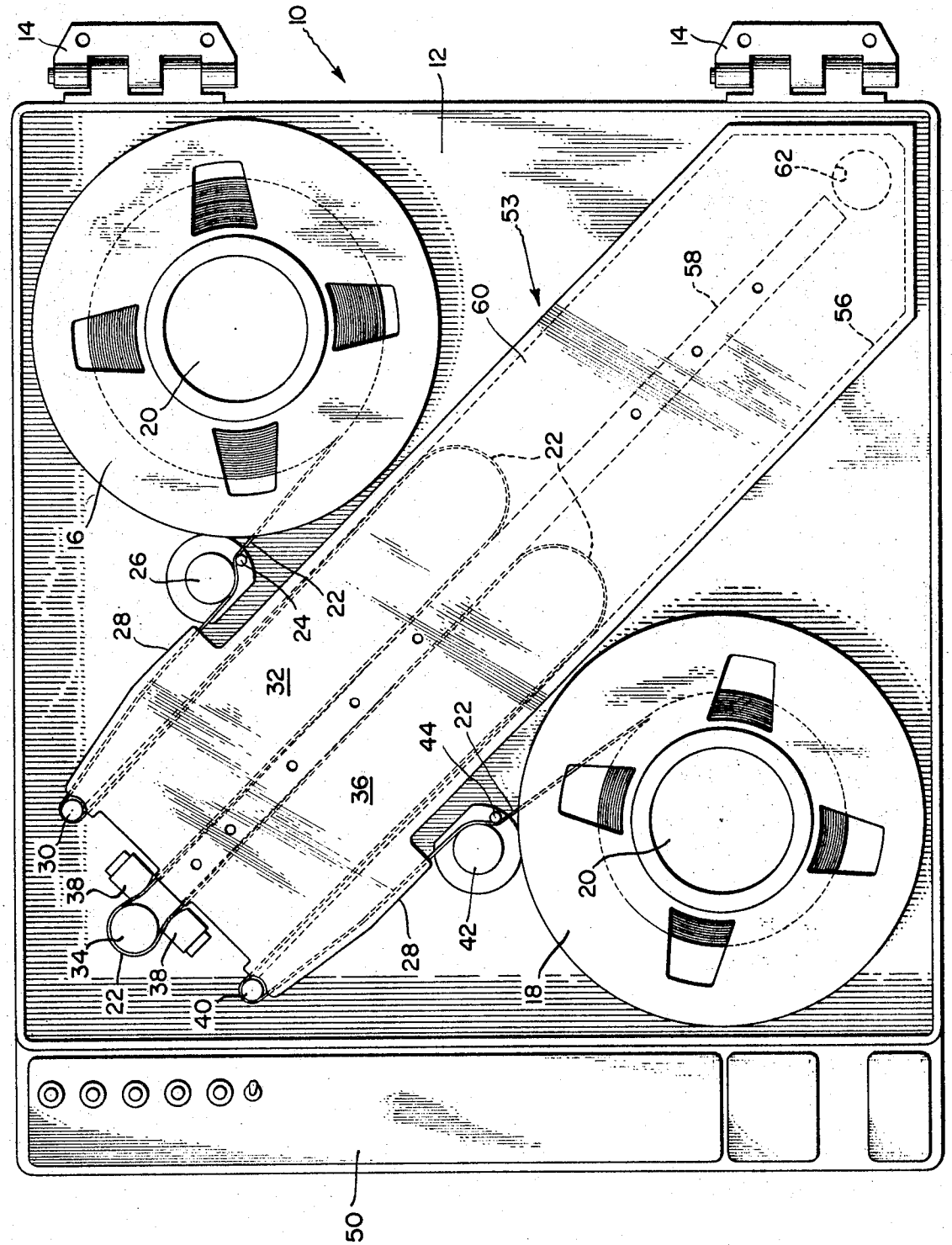


FIG. 1

INVENTOR.
HERBERT F. SANFORD
BY W. Michael Dysenter
ATTORNEY.

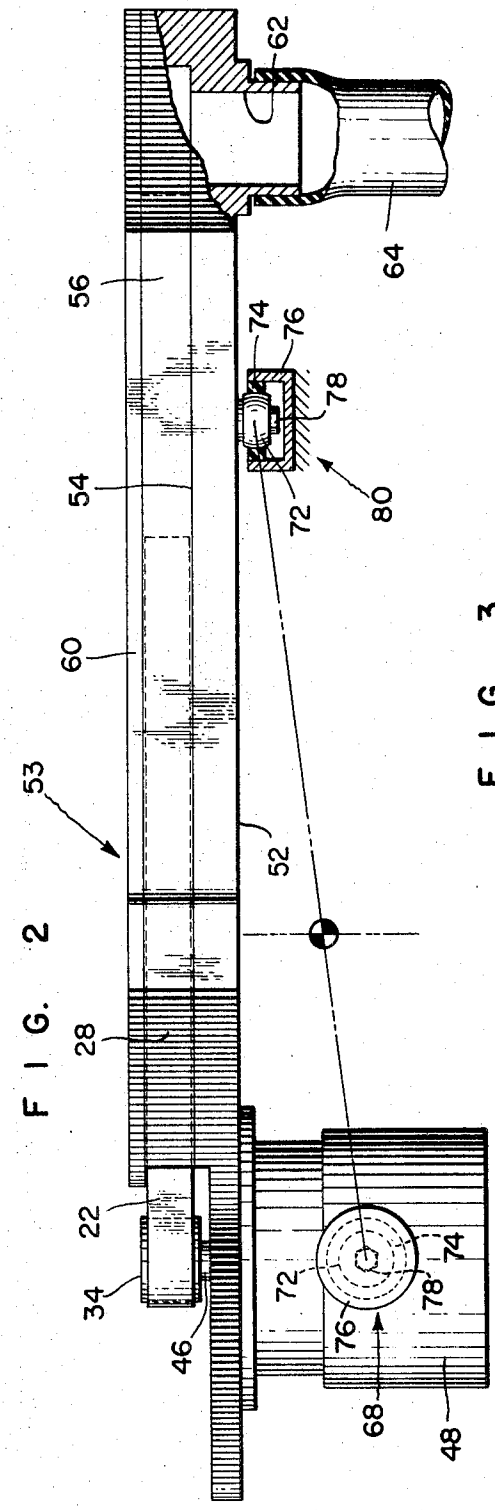


FIG. 2

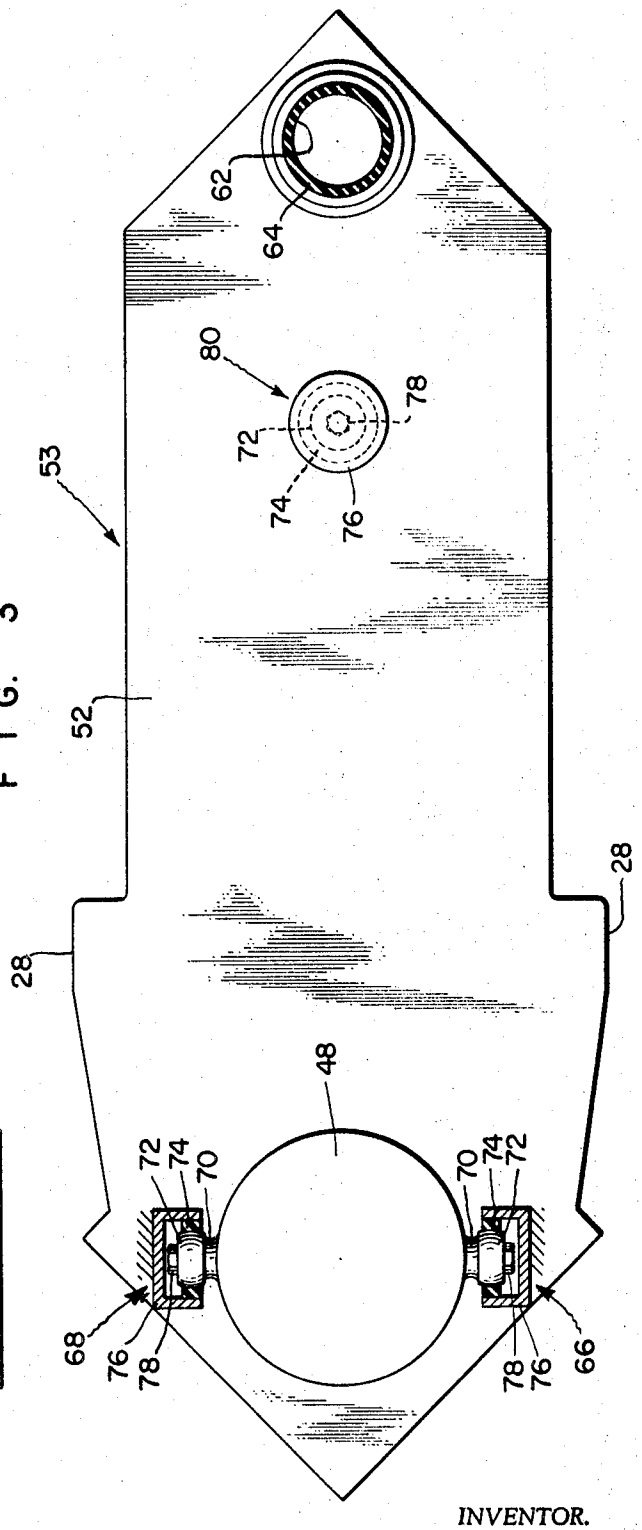


FIG. 3

INVENTOR.
HERBERT F. SANFORD
BY
ATTORNEY.

MOUNTING ARRANGEMENT

The present invention relates to a mounting arrangement and, more particularly, to a mounting arrangement for a web-driving assembly wherein the assembly is mounted for preventing shock and vibration from disturbing the driving motion of the web and from creating stress within slidably mounting arrangement.

It is well-known known in the prior art to shock mount a driving mechanism from the equipment driven thereby. Most of these arrangements prevent vibrations from the driving mechanism from affecting the driven equipment and are not concerned with preventing shock applied to the equipment from affecting the driving mechanism. The present invention is intended to be utilized within a web-driving arrangement wherein a web, such as magnetic tape, is driven at a precise predetermined rate of speed across a given area, such as an electromagnetic transducer mounting area. Prior-art magnetic tape transports have utilized a separate mounting plate for mounting the tape drive mechanism on the main frame of the tape transport. However, these mounting arrangements have been substantially rigid and continue to transfer vibration from the driving mechanism to the frame and to transfer shock and vibration from the frame to the driving mechanism. It has been found, for example, that a mounting plate may be precisely machined to within a thousandth of an inch, assembled, and mounted within the main frame of a magnetic tape transport prior to final assembly checks. Shock and vibrational forces acting on the main frame of the tape transport create stresses within the mounting plate which, in many cases, actually cause misalignment of the precisely machined plate during the check out period or during the early productive life of the tape transport. That is, the working vibrations transferred from the main frame to the mounting plate have caused stress relief within the precisely machined plate which produces dimensional changes therein. In the design of magnetic tape transports, where precision and tolerance problems are a prime concern, the dimensional changes caused by stress relief can create substantial deterioration in the performance thereof.

Accordingly, it is an object of the present invention to provide a mounting arrangement capable of isolating a driving assembly from shock and vibration and the stress created thereby.

Another object of the invention provides for a web drive mounting arrangement which prevents external shock and vibration from creating stress distortions within a mounted web-driving assembly.

A further object of the present invention is to provide a web drive mounting arrangement which is capable of preventing external shock and vibration from affecting the driven web.

Still a further object of this invention provides a web drive mounting arrangement which mounts the web drive assembly whereby shock and vibration transmitted thereto are directed and concentrated into areas that will not affect the driven web.

In accomplishing these objects there has been provided mounting plate means which is mounted within a main frame. Driving means drive a web across the mounting plate means; while first, second, and third mounting means are arranged for rotationally mounting the plate means within the main frame.

Other objects and many of the attendant advantages of the present invention will become readily apparent to those skilled in the art as a better understanding thereof is obtained by reference to the following detailed description when considered in connection with the accompanying drawings, wherein:

FIG. 1 is a front elevational view showing a web-driving assembly mounted on the main frame of a tape transport embodying the mounting arrangement of the present invention;

FIG. 2 is a side elevation showing the web drive mounting arrangement of the present invention; and

FIG. 3 is a rear view of FIG. 2.

Referring now to the drawings and particularly to FIG. 1, a magnetic tape transport is shown generally at 10 having a main frame 12 which is mounted in a suitable electronic rack, not shown, by hinge members 14. Mounted on the main frame 12 are a supply and takeup reel 16 and 18, respectively. The supply and takeup reel, 16 and 18, are mounted on the main frame 12 of the magnetic tape transport by mounting hubs 20 which attach to the shaft of a supply and takeup motor, not shown, mounted on the back of the main frame 12. A web member, such as magnetic tape 22, unwinds from the supply reel 16 and passes over a suitable guide 24 before wrapping around a tape cleaner 26. The tape then enters an edge guiding arrangement 28 of a tape bin before wrapping 180° about a guide roller 30 and entering a first vacuum bin 32. As tape exits the vacuum bin 32, it passes through an electromagnetic transducer mounting area and wraps 180° around a rubber coated capstan 34 before returning through the transducer mounting area and entering a second vacuum bin 36. Electronic transducers, in the form of magnetic record/reproduce heads 38, are provided in the transducer mounting areas between the first and second vacuum bins, 32 and 36, and the capstan 34. After exiting the second vacuum bin 36, the tape wraps 180° around a guide roller 40, passes through a second edge guide 28, over a second tape cleaner 42 and guide 44, and winds upon the takeup reel 18.

As best seen in FIG. 2, the rubber coated capstan 34 is mounted upon the shaft 46 of a capstan drive motor 48. The capstan drive motor 48 may be one of several suitable motors, such as a DC torque motor having a printed circuit rotor. The capstan drive motor 48 and reel motors, not shown, are controlled from a control panel 50. Each vacuum bin acts to provide a servocontrol for its related reel motor, as is well known in the art. The capstan drive motor and vacuum bins are mounted on a mounting plate 52 which forms the main support for a web driving assembly 53, FIGS. 2 and 3. In turn, the web driving assembly 53 is mounted by the web mounting arrangement of the present invention within the main frame 12.

In the present embodiment, the mounting plate 52 is placed diagonally across the surface of the main frame 12. The ends of the mounting plate 52 are therefore beveled at 45° to facilitate the mounting of the plate within the main frame 12. The first and second vacuum bins 32 and 36 are formed as part of the web driving assembly 53. Each bin being formed from the mounting plate 52 which has a tape contacting surface 54 with sidewalls 56 extending upwardly therefrom. The sidewalls 56 combine with a center wall 58 to mount an upper cover plate 60 at a fixed, space relationship parallel to the tape contacting surface 54 of the mounting plate 52. The magnetic tape 22 is thus edge guided between the tape contacting surface 54 and the parallel inner surface of the upper cover plate 60. The mounting plate 52 and the cover plate 60 are extended outwardly in the areas between the tape cleaners 26 and 42 and the guide rollers 30 and 44 for forming the edge guiding arrangements 28 referred to hereinabove. A vacuum port 62 is provided through the mounting plate 52 for supplying a vacuum to each of the vacuum bins, 32 and 36. The vacuum port 62 is connected by a suitable vacuum hose 64 to a source of reduced pressure, not shown.

As best seen in FIGS. 2 and 3, the web drive mounting arrangement for mounting the web driving assembly 53 and its mounting plate 52 includes a pair of spherical self-aligning bearings 66 and 68 which mount on suitable bosses 70 extending from opposite sides of the capstan drive motor 48. The bearings include a toroidal member 72 having a spherically shaped outer surface which slidably engages a second toroidally shaped member 74 having a spherically shaped inner surface. The second toroidally shaped member 74 may be constructed from an elastomeric material and is mounted within a U-shaped mounting frame 76, as by bonding. The toroidal member 72 thus forms a ball, while the second toroidal member forms a socket. This arrangement is known as a trunnion or gimbal bearing. A bolt 78 passes through the first toroidal member 72 and threadably attaches to the capstan

driven motor 48 at boss 70 for securing each bearing thereto. The Urshaped mounting frame 76 is attached to the main frame 12 by suitable means, such as welding. The first and second bearing, 66 and 68, are arranged on opposite sides of the capstan drive motor 48 for forming a common axis perpendicular to the longitudinal axis of the mounting plate 52 and parallel to the plane thereof. A third bearing 80 is mounted on the back surface of the mounting plate 52 opposite the tape contacting surface 54. This third bearing 80 is attached by a suitable bolt 78 to a point that is located along the longitudinal axis of the web drive mounting arrangement.

As each bearing is free to rotate in all planes, movements within the main frame 12, caused by external shock and vibration, are prevented from being transmitted to the web driving assembly 53 through its mounting plate 52. That is, the elastomeric toroidally shaped member 74 serves to absorb shock and vibration while the rotational freedom of the toroidal member 72 serves to further isolate the mounting plate 52 by preventing vibrational motion from passing thereto.

The first, second, and third bearings 66, 68, and 80 are arranged in a plane which passes through the center of gravity of the web driving assembly 53. Due to this arrangement, vibrational forces parallel to the tape contacting surface 54 are prevented from causing deflection of that surface. That is, forces acting parallel to the tape contacting surface 54 create a resulting force which reacts about the center of gravity of the web driving assembly. The first, second, and third bearings thus produce an equal and opposite resulting force which acts about the plane in which they are located. There is no resulting bending moment within the mounting plate 52 as the center of gravity is located in the plane created by the mounting points and the two forces react equally and oppositely against each other. This prevents the tape contacting surface 54 from undergoing a deflection due to the vibrational forces parallely acting thereon.

The third bearing 80 has been located on the center of percussion of the web driving assembly. That is, the first and second bearings form a common axis about which the mounting plate 52 can be rotated. The third bearing 80 is located at the point where an impulsive force applied perpendicularly thereto produces no impulsive reaction force along the common axis formed by the first and second bearings, but produces only a rotational force. Thus, vibrational forces applied perpendicularly to the tape contacting surface 54 produce only rotational motion about the common axis formed by the first and second bearings, 66 and 68. This arrangement prevents the tape contacting surface 54 from undergoing a sectional deflection or bending and tends to keep that surface flat and free of deflections absorbing the forces which would otherwise cause deflection by undergoing a uniform rotational motion about the common axis. Therefore, vibrational forces acting on the mounting plate 52 and its tape contacting surface 54 have no effect on the tape being guided thereacross as the surface is prevented from deflecting by the web drive mounting arrangement.

Thus, there has been provided a web drive mounting arrangement which isolates the movements of a main frame from the web driving assembly 53 and its mounting plate 52. Further, the mounting arrangement prevents vibrational forces from creating internal bending forces within the mounting plate 52 for causing the sectional deflection of the tape contacting surface thereof 54. This arrangement allows the magnetic tape to be driven across the mounting plate free of the damaging effect of shock and vibration.

Obviously, many modifications and variations of the present invention will become apparent to those skilled in the art; and, therefore, the present invention should be limited only by the appended claims.

I claim:

1. A mounting arrangement for isolating a vibration sensitive assembly from shock and vibration and the stress caused thereby, comprising:
- a main frame;
- a vibration sensitive assembly;
- mounting plate means for supporting said vibration sensitive assembly;
- first, second, and third mounting means each connected between said main frame and said mounting plate means and arranged to allow a movement of said mounting plate means in all planes with respect to said main frame;
- said first, second, and third mounting means each having one axis of movement arranged in a plane passing through the center of gravity of the combination of said mounting plate means and said vibration sensitive assembly; and
- whereby said vibration sensitive assembly is isolated from stress created by movements of said main frame.

2. A mounting arrangement as claimed in claim 1, wherein said mounting means include bearing means having a spherical portion attached to said mounting plate means and a second spherical portion arranged to receive said first mentioned spherical portion attached to said main frame.

3. A mounting arrangement as claimed in claim 1, wherein:
- said vibration sensitive means includes a web driving means and a surface parallel to a driven web; and
- whereby vibrational forces parallel to said surface are prevented from deflecting said surface.

4. A mounting arrangement as claimed in claim 1, wherein:
- said first and second mounting means attach to said mounting plate means and extend oppositely therefrom along a common axis for attachment to said main frame;
- said third mounting means attaches to said mounting plate means and extends therefrom perpendicularly to the common axis formed by the first and second mounting means at the center of percussion of the combination of said mounting plate means and said vibration sensitive assembly for attachment to said main frame;
- said vibration sensitive assembly includes a web driving means and a surface parallel to a driven web; and
- whereby vibrational forces perpendicular to said surface produce a rotational force about said common axis formed by said first and second mounting means.

5. A mounting arrangement for isolating a web driving assembly from shock and vibration and the stress caused thereby, comprising:
- a main support frame;
- mounting plate means having a web contacting surface;
- driving means mounted upon said mounting plate means and arranged to drive said web over the web contacting surface thereof;
- first and second bearing mounting means having a spherical portion attached to said driving means along a common axis on opposite sides thereof and a second spherical portion attached to said main frame for forming self-aligning bearings therebetween; and
- a third bearing mounting means having a spherical portion attached to said mounting plate means perpendicular to said common axis, formed by said first and second bearing mounting means, and a second spherical portion attached to said main frame for forming a self-aligning bearing therebetween;
- whereby said mounting plate means is free from stress caused by movements of said main frame.

6. A mounting arrangement as claimed in claim 5, wherein:
- said first, second, and third bearing mounting means are arranged to form a plane which passes through the center of gravity of said mounting arrangement;
- said third bearing mounting means is arranged at the center of percussion of said mounting arrangement;
- whereby vibrational forces parallel to said web contacting surface are prevented from deflecting said surface and vibrational forces perpendicular to said web contacting surface produces a rotational force about said common axis formed by said first and second bearing means.

7. A mounting arrangement as claimed in claim 5, additionally comprising:
- enclosure means extending from said web contacting surface;

cover means contacting said enclosure means for forming bin means into which said web is driven by said driving means; and

whereby said web is edge guided by said web contacting surface and said cover means.

8. A mounting arrangement as claimed in claim 6, wherein said web is magnetic tape, and said driving means includes a capstan and capstan motor means.