forty-three 8-dot cell holes. The optical reference plate **310** is stationary and is mounted parallel to the retention plates **200** with its single row of holes aligned with the dot pin holes **201** in the retention plates **200**.

In the embodiment shown, each cell **204** contains eight dot pins **100**. Each dot pin **100** has an up and a down position. In the up or raised display position, the exposed tips of the top portions **104** of dot pins **100** extend 0.032 inches above a TCM display surface typically provided in the form of a cover surface. In the down or erased position, the dot pins **100** are recessed 0.008 inches below the TCM display surface, so as to prevent the reader from interpreting a slightly exposed, but erased dot pin **100** as a printed dot pin **100**. Therefore, each dot pin **100** has a travel or stroke of 0.040 inches.

The bottom surface of each dot pin **100** serves as an anvil when struck by a solenoid **302** to drive the dot pin **100** into its raised position. The square shoulder portion **116** of each dot pin **100** limits the upward vertical travel of the dot pin **100** when the shoulder comes into contact with the bottom of the erasing mechanism **400**.

The dot pins **100** of the TCM are designed to move in an up and down fashion through the aligned guide holes **201** in each of the three equally spaced (0.080 inch spacing) parallel retention plates **200**, of 0.020 inch thickness each. Spacing between the parallel retention plates **200** is maintained by spacers **202** which are 0.060 inch thick. The dot pins **100** also pass through aligned holes in the erasing mechanism **400** noted above.

In operation of the TCM, vertical up and down motion of the erasing plate **402** is limited by the erasing mechanism **400** described below. The lower end of each dot pin **100** is configured with a square shoulder **116** so that when a dot pin **100** is in the raised position, its shoulder **116** acts as a mechanical stop against the bottom end of the erasing plate **402**. This prevents the top of the dot pin **100** from extending above the display surface of the TCM more than 0.032 inches.

Thus, in the printing mode, upward motion of a dot pin **100** is arrested when its square shoulder **116** comes into contact with the eraser plate **402**. The square shoulder **116** is also captured by the eraser plate **402** when the display is erased. Several variations of the erasing mechanism are considered possible. All variations accomplish the same task: the 0.0400 downward movement of the eraser plate **402**.

In the first variation shown in FIGS. **5**A, **5**B and **5**C, the easing mechanism **400** is a simply supported, channel shaped, beam structure whose assembly includes the eraser plate **402** and two parallel beams **404** laterally connected at their tops by the eraser plate **402**. The four ends of the beams **404**, in controlled motion, are moved down in unison by linear actuators **406** by the amount of desired dot pin travel (0.040 inch). After the solenoids **406** fire, thereby erasing the display, spring washers **408** on the plungers **410** of the solenoids **406** return the eraser plate **402** back to its normally up position.

The eraser plate **402** and the beams **404** can be configured as a one piece uniformly thick flat plate bent into the shape of a channel. In any configuration, the erasing plate **402** has to resist shear and bending forces imposed by drag forces that resist the motion of the dot pins **100**. The beams **404** should be dimensioned such that all bending deflections are about two or three orders of magnitude smaller than the amount of beam travel, e.g., 0.0004 inch. The ends of the beams **404** are mounted on linear actuators **406** capable of delivering the forces necessary to effect desired beam motion.

For example, the linear actuators **406** can be electromechanical solenoids, air cylinders, or cam operated devices attached to the beam to cause the desired motion. Past experience with a three piece integrated beam structure for a single line TCM was fraught with difficulty, owing to the inadequate metal thicknesses of the eraser plate **402** and the beams **404**, and their resulting inability to resist bending moment deflections imposed by dot pin drag forces. Part of the difficulty was from working with legacy dot pin dimensions. Therefore, in configuring an erasing mechanisms **400** especially for multi-line TCMs, the following are recommended:

A. Accurately determine dot pin **100** drag forces

B. Configure a robust one-piece channel-shaped beam structure for the erasing mechanism **400**. This configuration may require drilling or laser cutting the 8-dot cell hole patterns **204**.

C. Lengthen the lower diameter section **112** of the dot pins **100** to accommodate the increased metal thickness of the erasing mechanism **400**.

In the second variation shown in FIG. **8**, the erasing mechanism **400** includes the erasing plate **402** as described above and two cam rods **412**. The cam rods **412** are located between the bottom retention plate **200** and the erasing plate **402** along the length of their sides. To erase the display, the twin rods **412**, with cam-shaped cross-sections, are given a 90 degree angular rotation, thereby exerting a uniformly distributed separating force along the entire length of the sides of the erasing plate **402** and the bottom retention plate **200**. The erasing plate **402** is still subject to the same bending as that of the first variation noted above. The cam rods **412** must be of sufficient cross-section to resist torsional twist.

The twin cam rods **412** have geared ends **414** that mesh with a drive pinion **416** located midway between them. The drive pinion **416** has a spring **418** to return the drive pinion from its rotated position back to its normal position. A 90 degree rotation of the drive pinion **416** causes the cam rods **412** to rotate 90 degrees, forcing the erasing plate **402** and the dot pins **100** to move downward relative to the retention plate **200**, thereby erasing the TCM display. The erasing plate is floated and supported on springs **420** to lift the erasing plate back up against the bottom retention plate **200** after erasing occurs.

In a third variation of erasing mechanism shown in FIGS. **9**A, **9**B and **9**C, twin tapered wedges **422** are moved laterally inwards towards one another to increase the vertical space between the erasing plate **402** and the bottom retention plate **200**, thereby erasing the display. The wedges **422** are moved by linear actuators **424**. The actuators **424** can be operated by mechanical, electrical, pneumatic, or other means and can have mechanical springs **426** to return the wedges to their normal outward position.

The linear motion undercarriage **600** in the embodiment shown in FIGS. **4**A, **6**A, **6**B and **6**C can be any one of several commercially available linear motion devices such as a Thomson Miniature Accu-Glide Model 10. The undercarriage **600** includes a carriage **602** that moves linearly along a fixed guide **604**.

An electric drive motor **700** shown in FIGS. **7**A, **7**B and **7**C can be any one of several miniature commercially available reversing d.c. electric motors, commonly used in various printing devices. The motor **700** is mounted underneath one end of the TCM display, vertically between the retention plates **200** and the linear motion undercarriage **600**. The electric drive motor **700** is fitted with a toothed drive pulley **702** for driving a toothed power transmission