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ASSEMBLY OF SMALL PHOTOSENSITIVE FRAGILE ELEMENTS

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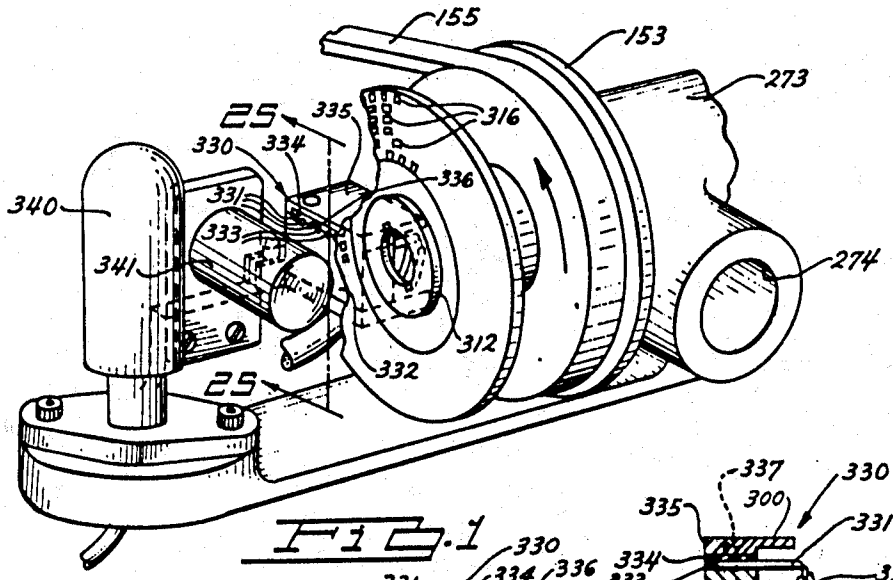


Fig. 1

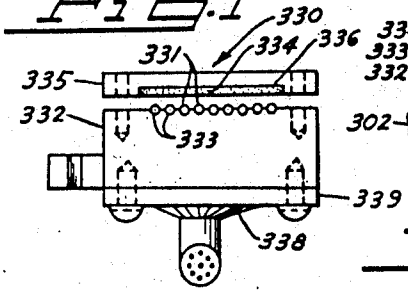


Fig. 3

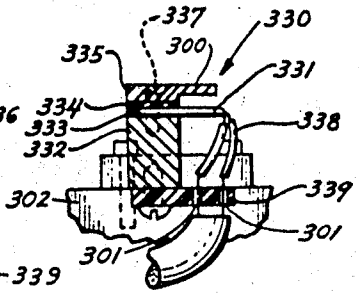


Fig. 2

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ASSEMBLY OF SMALL PHOTOSENSITIVE FRAGILE ELEMENTS

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This invention relates to photoelectric devices, and more particularly to a photodiode assembly and an improved means of retaining the photodiodes thereof.

It is often necessary to employ a photodiode assembly comprising a row of light sensitive photodiodes to provide electric signals used to operate some other mechanism. For example, photodiode assemblies of this kind are used in connection with the code disk and the paper format control mechanisms of the printer disclosed in U.S. application Serial No. 138,157, entitled High Speed Printer, filed on September 14, 1961 in the names of Arvin D. McGregor and James M. Irvine, Jr. The purpose and operation of these photodiode assemblies are explained in detail in the above referenced application, the disclosure of which is incorporated by reference.

The individual photodiodes are usually quite small and very delicate, the photoelectric device being enclosed in a glass capsule which is difficult to hold in assembly and subject to failure due to vibration. Failure not only involves the expense of a new photodiode, but even more important, it involves printer down-time and the cost of repair.

This invention relates to a means of mounting a photodiode, or a row of photodiodes, in a manner such that the tendency to move out of adjustment or fail due to vibration and other causes is greatly reduced, thus eliminating the above problems.

The objects and advantages of the invention will become more apparent upon reference to the following specification and the attached drawings, wherein:

FIGURE 1 illustrates a photodiode assembly embodying the invention and used in connection with the code disk of the printer disclosed in the above referenced application;

FIGURE 2 is a cross-sectional view taken on the plane of line 2—2 of FIGURE 1;

FIGURE 3 is an elevational view looking at the left hand side of FIGURE 2 before assembly is completed.

Referring to the drawings in greater detail, the photodiode assembly **330** comprises a base member **332** having any desired number of half cylindrical depressions **333** formed in parallel relation across the top surface thereof, the depressions **333** having the same diameter as the diameter of the individual photodiodes **331** and being spaced the same distance apart as it is desired to position the photodiodes in the assembly **330**.

The photodiodes **331** are standard purchased items, and they are provided with the necessary leads **338**.

Another element of the assembly **330** is the cover member **335** having a notch **336** formed therein, the notch being at least as long as the distance between the end photodiodes. The member **335** may have a thicker portion having the same width as the base member and in which the notch **336** is formed and a thinner portion **300** extending from the thicker portion so that the width of the cover member **335** is substantially equal to the length of the photodiodes **331**, thus protecting the photodiodes from being accidentally broken.

A further element of the assembly **330** is the block of rubber or other resilient material **334** having substantially the same outer dimensions as the dimensions of the notch **336** on the cover member **335** so that it may be inserted in the notch.

As best seen in FIGURE 3, the complete assembly **330** is made by first placing the photodiodes **331** in the half cylindrical depressions **333** with their light sensitive ends facing in the same direction. The rubber or other resilient block **334**, is then inserted into the notch **336** of the cover member **335**, and the cover member is applied over the photodiodes **331** and secured to the base member **332** by any suitable means such as the screws **337**.

It will be noted that the resilient block **334** when inserted into the notch **336** of the cover member **335** is the same thickness as the depth of the notch so as to provide a straight-line surface on the side of the cover member that is adjacent the base member. Thus, when the cover member and the base member are secured together by the screws **337**, the portions of the photodiodes that protrude beyond the surface of the base member are compressed into the resilient block **334**. In other words, it is the resilient block **334** that actually holds the photodiodes **331** in the depressions **333** in a shock resistant manner.

It may be desirable to provide a resilient block **334** that extends some amount out of the notch **336**. Unless this is done, however, it is not desirable to form similar depressions in the resilient block to receive the photodiodes because it would eliminate some of the compressive force holding the photodiodes. Also, the shape of the depressions **333** could be varied, depending upon the shape of the elements to be retained.

An insulating member **339** having openings **301** to receive the separate leads from the photodiodes may be secured to one side of the base member **332**, and the completed assembly **330** may be secured to any suitable support member **302** with the light sensitive ends of the photodiodes **331** facing the light source **340**.

With the above construction, the photodiodes will be securely and accurately retained in position, but protected against breakage due to vibration or other causes.

Another advantage of the invention is that it permits proper retention of photodiodes or other elements of this kind despite the fact that they usually vary in diameter or outside dimension to the extent that the use of rigid or solid retaining members would apply excessive pressure on the element having the greatest outer dimension and fail to properly grip the photodiode or other element in the group having the smallest outer dimension. The use of a rubber block between a base and a cover member also permits limited lengthwise adjustment of the individual photodiodes without loosening the cover member; this would not be possible with the use of non-resilient base and cover members without a resilient block.

It is apparent that this type of assembly is not limited to the mounting of photodiodes; rather, it may be employed for similarly holding any small and fragile elements of this nature. It is also apparent that any number of elements or photodiodes may be mounted and that various other modifications can be made without exceeding the scope of the appended claims.

What I claim as my invention is:

1. A photodiode assembly, comprising a first support member having a plane surface formed with a series of parallel spaced half cylindrical depressions extending across the width thereof, said first support member being rigid, a cylindrical photodiode having substantially the same diameter as said depressions and positioned in each of said depressions so that half of each photodiode extends above said plane surface, the light sensitive ends of said photodiodes being aligned along one edge of said plane surface and the opposite ends thereof extending beyond the opposite edge of said plane surface, a second rigid support member having a plane surface in engagement with said plane surface of said first support mem-

ber so that said rigid support members establish a predetermined rigid reference position for said photodiodes, said plane surface of said second support member being formed with a notch longer than the distance between the end depressions, a block of material filling said notch, said block of material being resilient and soft relative to said rigid members, and said first and second support members being secured together so that the extending portions of said photodiodes are pressed into said resilient material and held in said depressions by the deformation of said resilient material.

2. An assembly of similar photosensitive elements having leads at one end and photosensitive surfaces at the opposite ends comprising; a rigid first support member having a plane surface provided with a series of parallel spaced depressions extending across the width thereof, an element to be retained positioned in each of said depressions with a portion of each element extending above said plane surface, the rigid property of said first support member establishing an inflexible reference for the retention of said elements to maintain said elements in fixed positions relative to each other and to said support member, a second support member having a plane surface in engagement with the plane surface of said first support member, said plane surface of said second support member having a notch confronting said depressions, a block in said notch, said block being resilient and soft relative to said first support member and to said elements, said

first and second support members being secured together so that said portions of said elements are pressed into said resilient material causing it to deform and hold said elements in said fixed positions with their photosensitive surfaces facing in one direction outwardly of said depressions and aligned along one edge of said plane surface of said rigid support member, and with their leads extending to the exterior of said first and said second support members.

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