April 5, 1960 R. H. METZGAR 2,931,477

BALL AND PLASTIC HOUSING ASSEMBLY

Filed March 5, 1957

Fig-1

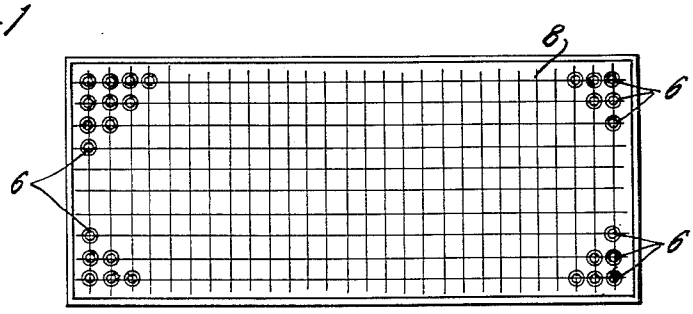


Fig-2

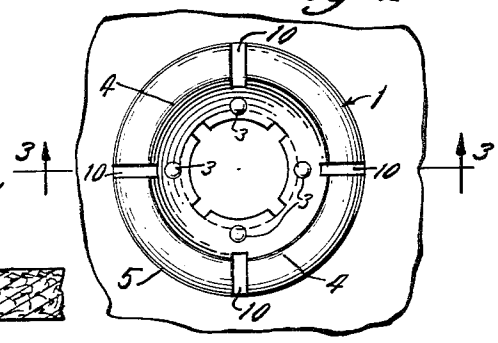


Fig-3

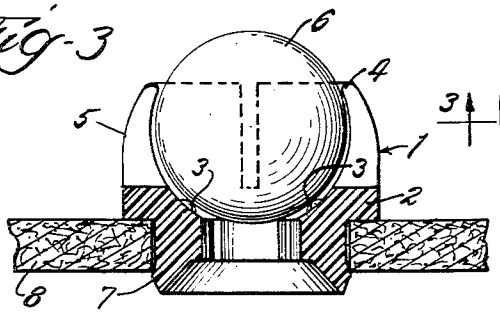
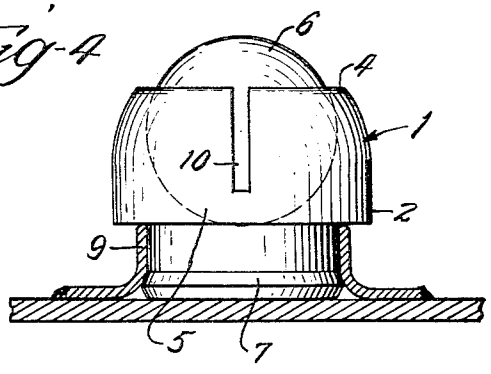


Fig-4



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BALL AND PLASTIC HOUSING ASSEMBLY

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11 Claims. (Cl. 193—35)

This invention relates to conveyors and transfer tables, and more particularly refers to ball and housing assemblies which, when affixed thereto, allow articles to slide easily thereover in any direction.

There are several methods used to enable articles to slide along a conveyor or transfer table with little friction. One method is to provide rollers or wheels placed at intervals over the table, allowing the articles to be slid easily in either of two different directions. In order to provide for movement in any direction, it is common practice to affix ball and housing assemblies to the conveyor or table at intervals. When the object is then pushed along the table, the balls roll within their housings and allow the article to be pushed along with very little effort. The balls are generally made of steel and are held within steel housings. Inside the housing, and supporting the steel ball, is generally placed a bed of very small balls. The large ball then rolls over the small balls and allows movement with very little friction. The ball-type transfer unit has the advantage over the roller or wheel type in that the direction of conveyance is not limited to two directions but may be in any direction.

Although the ball and steel housing assemblies currently used have been found satisfactory for most purposes, they have several disadvantages. First, they are almost impossible to clean inside when they become dirty. Second, the large ball rolling on the small balls does not roll true but tends to change direction and oppose straight-line travel. When the assemblies are used in conjunction with food, it is difficult to maintain the necessary level of sanitation since a large part of the unit is inaccessible. Additionally, the useful life of the assembly is somewhat limited, and it is desirable to have an assembly whch would operate satisfactorily over a longer period of time without a great increase of friction and eventual need for replacement.

The present invention satisfies all of the needs above indicated.

The present invention provides a ball and housing assembly which has low friction and wears an amazingly long time with little or no increase in friction. It may be easily cleaned and made sanitary by washing with live steam and with detergents. It is not even necessary to remove the ball from the housing. The assembly has high weight capacity and the ball rolls true, without any tendency to deflect the article from a straight line.

A surprising array of other advantages is attained:

The ball and housing assembly is quiet in operation, whereas the prior type was quite noisy.

It is electrically non-conductive permitting electrical testing on the table when desired.

The assembly withstands impacts with no permanent deformations of a magnitude which would flatten the sides of the small balls in the old units.

The housing may be easily molded.

The assembly may be manufactured cheaply.

Other objects and advantages of the present invention

will become more apparent from the following description and drawings.

Fig. 1 is a top view of a ball transfer table containing embedded therein a plurality of the ball and housing assemblies of the present invention.

Fig. 2 is a top view of a ball and housing assembly.

Fig. 3 is a cross-sectional view of a ball and housing assembly.

Fig. 4 is a side view of a ball and housing assembly showing a modified form of attaching the assembly to a table.

Although the following disclosure offered for public dissemination is detailed to ensure adequacy and aid understanding, this is not intended to prejudice that purpose of a patent which is to cover each new inventive concept therein no matter how it may later be disguised by variations in form or additions of further improvements. The claims at the end hereof are intended as the chief aid toward this purpose, as it is these that meet the requirement of pointing out the parts, improvements, or combinations in which the inventive concepts are found.

Viewing Fig. 2, a socket or housing is formed by the side wall 1 and the bed 2. The bed 2 may be provided with hemispherical nibs 3 to provide points of contact for the steel ball to slide upon, and thus diminish friction between the steel ball and the housing. The lips 4 of the housing curve inward so that the diameter of the aperture formed by the lips is smaller than the diameter of the ball, thereby containing the ball within the socket or housing even when the housing is inverted. Notches 10 are provided in the housing wall 5, first, to allow the inside of the housing to be accessible for cleaning, and second, to provide sufficient resilience in the housing wall so that even if the aperture is much smaller than the ball, the lip can be spread sufficiently to enable the ball to be pushed into the socket, and to allow the lip to resume its former shape and retain the ball within the socket after the ball has been inserted. With a one inch ball, a $15/16$ inch aperture has been found satisfactory.

Fig. 3 shows the ball 6 held within the socket. A neck 7 is provided in the housing so that it may be inserted in a hole in the transfer table 8.

Fig. 4 demonstrates an alternative method of affixing the socket to the table. In this method a collar 9 is affixed to the transfer table and the housing neck inserted therein.

The housing as described above is molded from a synthetic resin and preferably a linear polyamide resin such as nylon or caprolactam, although nylon is the preferred material. These materials are strong, have a high impact and wear resistances, and have a very low coefficient of friction. These properties render them excellent for use as bearing materials. They are additionally very readily molded. Additives such as graphite or molydenum sulfide may be incorporated in the molding compounds in order further to reduce friction. Housings may also be constructed of other plastics such as polyethylene or polystyrene, especially if a nylon bearing surface is inserted in the socket. Alternatively, fibers of nylon or caprolactam may be incorporated in other plastic materials such as phenolics, imparting to them friction reducing properties. It is especially desirable that the nibs 3 have the low friction characteristics of nylon or caprolactam.

The ball of the present assembly is preferably made of steel, since it is strong and has a low coefficient of friction when used in conjunction with a nylon surface. The usual chrome alloy rust resistant balls of the past are satisfactory unless corrosive conditions justify the greater cost of stainless steel.

The housing is molded in the shape of a cup and the

inside is contoured to provide a socket into which the ball can be placed. The side walls curve upwardly and inwardly, ending in a lip defining an aperture whose circumference is somewhat smaller than the major circumference of the ball. As a result thereof, the lip will serve to contain the ball within the socket even if the socket is inverted. One or more slots are provided in the housing wall in order to allow easy insertion or removal of the steel balls. A bed is provided at the bottom of the socket for the ball to ride upon and the bed is shaped to center the ball within the socket. Small nibs or projections may also be provided upon which the ball may roll in order further to decrease the area of frictional contact between the ball and the housing. Additionally, a hole may be provided in the center of the housing bed in order to let any grit or other dirt fall out and to allow easier access for cleaning. The bottom of the housing may be narrowed to form a neck which may be inserted by pressure into a hole in the transfer table provided therefor. Alternatively, as shown in Fig. 4, a collar may be provided above the surface of the transfer table into which the housing may be inserted.

In operation, a plurality of ball and housing assemblies are inserted in a transfer table as shown in Fig. 1. The number required and the spacing will be determined by the weight and size of the object which is to be used in conjunction with the table. Spacings commonly used may vary from 2 inches to 6 inches center-to-center depending upon requirements.

The present assemblies have many advantages over prior all-steel assemblies. They may be easily cleaned with water and detergent or even steam without deterioration or rusting. The plurality of slots in the housing provides easy access for the cleaning medium without removing the balls. Alternatively, the balls may easily be removed from the sockets if necessary for some unusual reason. Operation is noiseless. The assemblies have no tendencies to deflect straight-line travel, and operate at low friction. The nylon housings will wear longer than the traditional steel ones and will support a greater load without excess wear or damage. Since the plastic material used is non-conductive, objects having energized electrical circuits (as during testing) may be used. Finally, although nylon is a relatively expensive raw material, the easy molding and other advantages obtained allow the assemblies to be more economically produced than the all-steel assemblies.

Although the present invention has been described with respect to particular ball and housing assemblies for transfer tables, many variations of the invention may be practiced. The shape of the housing may be varied considerably. The means for fastening the housing to the transfer table may also be varied considerably. For instance, threads may be provided and the housing may be screwed into the table. The assemblies may also be used as casters. Additionally, the bed upon which the steel ball rides may also be varied considerably. As described above, projecting nibs may be provided. Alternatively, the ball may ride on ledges of various shapes. The shape illustrated, assuming omission of the nibs, has been found satisfactory except when the minimum friction conditions are required. In fact, its friction is lower than that of the past constructions using a bed of small balls during most of their life, although not when new and in perfect condition.

I claim:

1. A ball and housing assembly comprising in combination a molded plastic housing comprised of nylon, having sides forming a socket, and a base carrying the sides and constructed to be secured to a support, and a steel ball rotatably positioned within said socket, a portion of said steel ball projecting beyond the wall of the housing, said ball resting upon a fixed positioning nylon load bearing surface at the bottom of said socket, the wall of the housing curving over the diameter of the ball and inwardly, terminating in lip means defining an aperture whose diameter is smaller than the diameter of the ball.

2. A ball and housing assembly comprising in combination a molded plastic housing comprised of nylon, having sides forming a socket, and a base carrying the sides and constructed to be secured to a support, and a steel ball rotatably positioned within said socket, a portion of said steel ball projecting beyond the wall of the housing, said ball resting upon a fixed positioning nylon load bearing surface at the bottom of said socket, the wall of the housing curving over the diameter of the ball and inwardly, terminating in lip means defining an aperture whose diameter is smaller than the diameter of the ball, said wall being provided with a plurality of slots extending to said aperture and separating the wall into segments.

3. A ball and housing assembly comprising in combination a molded plastic housing comprised of nylon, having sides forming a socket, a steel ball rotatably positioned within said socket, a portion of said steel ball projecting beyond the wall of the housing, said ball resting upon the positioning load bearing surface comprised of nibs at the bottom of said socket, the wall of the housing curving over the diameter of the ball and inwardly, terminating in lip means defining an aperture whose diameter is smaller than the diameter of the ball, said wall being provided with a plurality of slots extending to said aperture and separating the wall into segments.

4. A ball and housing assembly comprising in combination a molded plastic housing comprised of a synthetic resin, having sides forming a socket, and a base carrying the sides and constructed to be secured to a support, and a steel ball rotatably positioned within said socket, a portion of said steel ball projecting beyond the wall of the housing, said ball resting upon a fixed positioning synthetic resin load bearing surface at the bottom of said socket, the wall of the housing curving over the diameter of the ball and inwardly, terminating in lip means defining an aperture whose diameter is smaller than the diameter of the ball.

5. A ball and housing assembly comprising in combination a molded plastic housing comprised of a linear polyamide resin, having sides forming a socket, and a base carrying the sides and constructed to be secured to a support, and a steel ball rotatably positioned within said socket, a portion of said steel ball projecting beyond the wall of the housing, said ball resting upon a fixed positioning load bearing surface of linear polyamide resin at the bottom of said socket, the wall of the housing curving over the diameter of the ball and inwardly, terminating in lip means defining an aperture whose diameter is smaller than the diameter of the ball.

6. A ball and housing assembly comprising in combination a molded plastic housing comprised of a synthetic resin, having sides forming a socket, and a base carrying the sides and constructed to be secured to a support, and a steel ball rotatably positioned within said socket, a portion of said steel ball projecting beyond the wall of the housing, said ball resting upon a fixed positioning load bearing surface comprised of nylon at the bottom of said socket, the wall of the housing curving over the diameter of the ball and inwardly, terminating in lip means defining an aperture whose diameter is smaller than the diameter of the ball.

7. A ball and housing assembly comprising in combination a molded plastic housing comprised of a synthetic resin, having sides forming a socket, and a steel ball rotatably positioned within said socket, a portion of said steel ball projecting beyond the wall of the housing, said ball resting upon a positioning load bearing surface comprised of nylon nibs at the bottom of said socket, the wall of the housing curving over the diameter of the ball and inwardly, terminating in lip means defining an aperture whose diameter is smaller than the diameter of the ball.

8. A ball and housing assembly comprising in combination a molded plastic housing comprised of a synthetic resin, having sides forming a socket, and a base carrying the sides and constructed to be secured to a support, and a steel ball rotatably positioned within said socket, a portion of said steel ball projecting beyond the wall of the housing, said ball resting upon a fixed positioning synthetic resin load bearing surface at the bottom of said socket, the wall of the housing curving over the diameter of the ball and inwardly, terminating in lip means defining an aperture whose diameter is smaller than the diameter of the ball, the bottom of the housing forming a hollow stem adapted to fit into a supporting ring and forming a passage out from the inside of the socket for escape of dirt.

9. A ball and housing assembly comprising in combination a molded plastic housing comprised of a synthetic resin, having sides forming a socket, and a base carrying the sides and constructed to be secured to a support, and a ball rotatably positioned within said socket, a portion of said ball projecting beyond the wall of the housing, said ball resting upon a fixed positioning synthetic resin load bearing surface at the bottom of said socket, the wall of the housing curving over the diameter of the ball and inwardly, terminating in lip means defining an aperture whose diameter is smaller than the diameter of the ball, said bearing surface and ball being formed of materials having as low friction as steel on nylon.

10. A ball and housing assembly comprising in combination a housing having sides forming a socket with an aperture, and a steel ball rotatably positioned within said socket, a portion of said steel ball projecting through

the aperture, said ball resting upon a positioning load bearing surface comprised of nylon nibs facing the aperture of said socket, the wall of the housing curving over the diameter of the ball and inwardly, terminating in lip means defining the aperture, the diameter of the aperture being smaller than the diameter of the ball, said nibs being spaced to normally position the ball free from contact with other parts of the assembly.

11. A ball and housing assembly comprising in combination a housing having sides forming a socket with an aperture, and a steel ball rotatably positioned within said socket, a portion of said steel ball projecting through the aperture, said ball resting upon a positioned load bearing surface comprised of nibs of a synthetic resin having a low coefficient of friction on steel, facing the aperture of said socket, the wall of the housing curving over the diameter of the ball and inwardly, terminating in lip means defining the aperture, the diameter of the aperture being smaller than the diameter of the ball, said nibs being spaced to normally position the ball free from contact with other parts of the assembly.

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