Aug. 7, 1962 M. M. FRIEDMAN 3,048,400

BOWLING PIN

Filed Dec. 6, 1957

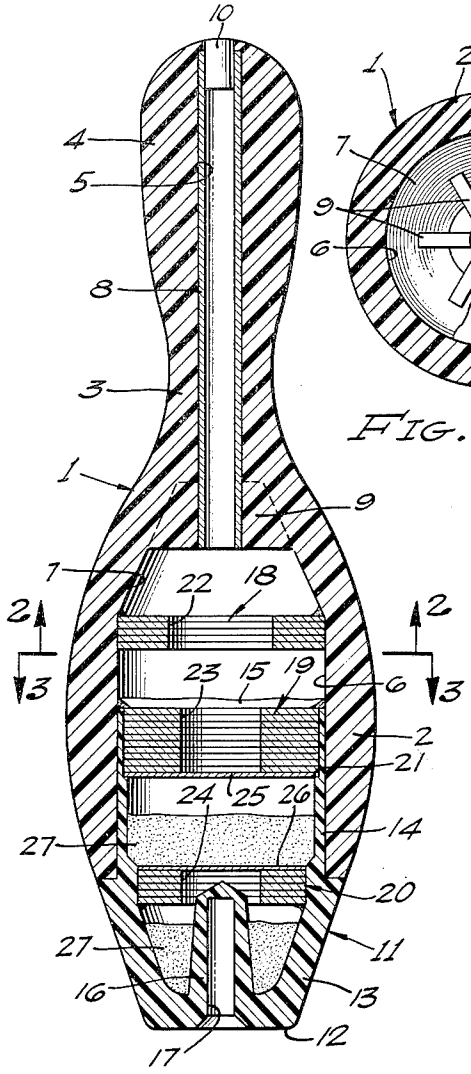


FIG. 1.

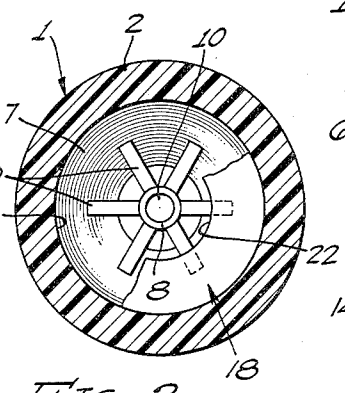
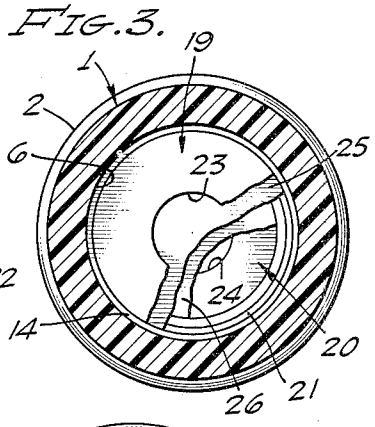


FIG. 2.

FIG. 3.



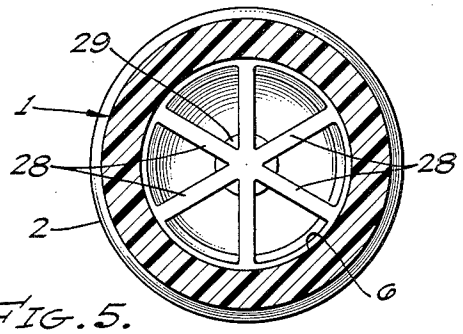


FIG. 5.

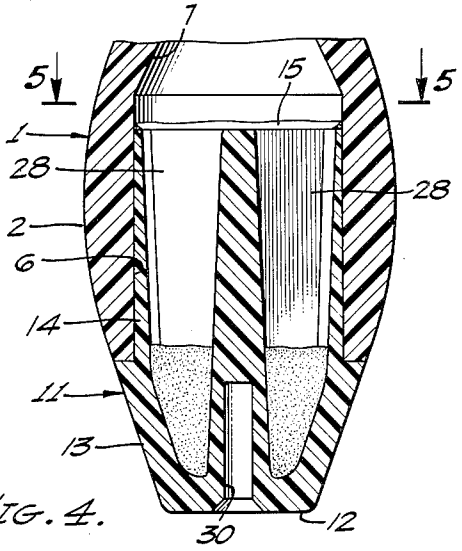


FIG. 4.

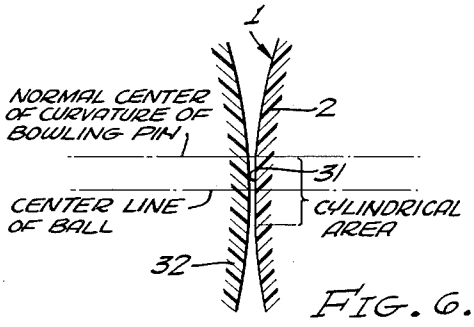


FIG. 6.

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BOWLING PIN

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This invention relates to bowling pins, more particularly to bowling pins molded of plastic material. Bowling pins now in common use are made of maple, or maple coated with a vinyl plastic film. The deficiencies of wood, even an excellent hard wood such as maple, have long been recognized. However, the game of bowling has been dependent upon the particular manner in which the bowling pins bounce and scatter when struck by a bowling ball. The bowling pin must have a "bounce" which closely approaches that of a maple bowling pin in magnitude; that is, the pattern of the "pin fall" must be close to that of a wooden bowling pin. Otherwise the bowling pins would not move in the various characteristic patterns when struck by the bowling ball moving through the different typical paths down the bowling alley, and the resulting score would differ. Furthermore, the "sound" should approach closely to the characteristic sound produced by maple pins when struck by the bowling ball in order to be acceptable to the bowler.

It is well known that slight changes in the course taken by the bowling ball and the resulting slight changes in the point of initial impact have a marked effect on the number of pins knocked down. The dispersal patterns taken by the bowling pins actually struck by the bowling ball and those struck by other bowling pins are extremely complex, and consequently easily altered by any change in the physical properties of the bowling pin.

It is well known by bowling alley operators, but less well known by bowlers, that even new wooden pins vary in weight and bounce, and that as the bowling pins become worn, chipped, and otherwise damaged, and are refinished or repaired, their physical properties vary substantially more.

The "good condition" life of a wooden bowling pin is relatively short. The wooden bowling pin is damaged to the point of needing repair after approximately 500 "lines" (i.e., 5000 engagements by the bowling ball). Obviously its physical characteristics, such as its degree and direction of bounce, are adversely affected long before 500 lines. It is the usual practice to repair and recondition the wooden bowling pins after each 500 lines, and 2000 lines represent about the maximum useful life. But as indicated, during much of this life the bowling pin has suffered such change in its character that the bowler's game is adversely affected. The patron or bowler is not usually aware of this because he is too far from the bowling pins to inspect them, and there is little or no change in sound or change readily observable from the patron's end of the alley to call his attention to the deteriorated quality of the bowling pin.

Thus, it is not a solution to the problem to make a plastic bowling pin which is "better" than a wooden bowling pin in good condition. Instead, the plastic bowling pin must have such characteristics that, when used on an alley neighboring an alley having wooden bowling pins in good condition, the difference in action and sound will not be noticeable to the patron; otherwise, even though an unbiased scientific test might show the plastic bowling pin to be "better," the patron will not accept it.

With the foregoing résumé of the problem in mind, the objects of the present invention include:

First, to provide a plastic bowling pin which duplicates closely the observable characteristics of a maple bowling pin in good condition, such as to exhibit a comparable "bounce," to produce a pattern of "pin fall" corresponding closely to a maple bowling pin, and to produce a sound closely simulating the sound produced by maple bowling pins, when struck by the bowling ball and by each other.

Second, to provide a plastic bowling pin which is capable of withstanding impact of a bowling ball and impact from other bowling pins without splitting, cracking, or chipping, and which in fact, remains in virtually its initial condition after many hundreds of "lines"; that is, long beyond the life of a maple bowling pin even though the life of the maple bowling pin is prolonged by repeated reconditioning and repair; thereby providing a bowling pin which, though having a necessarily higher initial cost than maple bowling pins, has instead such prolonged life that the cost per line by the bowling alley operator is materially reduced.

Third, to provide a plastic bowling pin which utilizes a novelly constructed body member and bottom member of different Shore hardness to provide optimum resilience in the region of impact by a bowling ball, and optimum hardness and strength at the bottom of the bowling pin so that the stability of the bowling pin is not impaired with use.

Fourth, to provide a plastic bowling pin having a sound chamber and means contained therein whereby the bowling pin may be predesigned to produce a desired sound and exhibit a desired bounce.

With the above and other objects in view, as may appear hereinafter, reference is directed to the accompanying drawings in which:

FIGURE 1 is a longitudinal sectional view of a bowling pin incorporating the present invention;

FIG. 2 is a transverse sectional view through 2—2 of FIG. 1;

FIG. 3 is a transverse sectional view through 3—3 of FIG. 1;

FIG. 4 is a fragmentary, longitudinal sectional view similar to FIG. 1 showing a modified construction;

FIG. 5 is a transverse sectional view through 5—5 of FIG. 4;

FIG. 6 is a fragmentary, substantially diagrammatical, sectional view of the ball-engaging zone of the bowling pin as well as the bowling ball.

The bowling pin includes a body member 1 molded of plastic material. Externally the body member is contoured to define a belly 2, neck 3, and head 4 of a bowling pin. Internally the body member 1 is provided with a longitudinal bore 5, which is enlarged in the region of the belly portion 2 to form a cylindrical chamber 6 which converges conically, as indicated by 7, at its upper portion.

Molded or cast within the bore 5 is a reinforcing tube 8, preferably formed of aluminum, or of glass fabric reinforced plastic. The lower end of the tube projects a short distance within the conical portion 7. Radiating webs 9 extend inwardly from the sides of the conical portion 7 to the reinforcing tube 8. The upper end of the bore 5 may be closed by a plug 10.

A bottom member 11 is provided which is also molded of plastic material. The bottom member forms externally a flat base 12 and a conical side portion 13 which converge upwardly to the lower end of the belly 2 of the body member 1. The bottom member 11 includes an integral cylindrical shell 14 which telescopes into the cylindrical chamber 6.

The body member 1 and bottom member 11 are permanently joined together by adhesive or solvent cement 15 applied between the confronting surfaces of the cylindrical chamber 6 and the cylindrical shell 14. In practice, excess cement upwells above the shell. The bottom

member 11 as well as the cylindrical shell 14 are hollow. The bottom member may be provided with an internal boss 16 bored to form a center hole or socket 17.

Before joining the body member 1 and bottom member 11, a series of sound and bounce control disks are inserted. A disk 18 is cemented in the upper end of the cylindrical portion 6 adjacent the conical portion 7. Two disks 19 and 20 are cemented within the cylindrical shell 14. The disk 19 is located at the upper end of the shell and rests on a shoulder 21. The lower disk 20 is disposed adjacent the conical lower portion of the bottom member 11. The disks have, respectively, central openings 22, 23, and 24. The second disk 19 is preferably twice as thick as the other two disks and the opening 22 in the upper disk is preferably larger than the openings 23 and 24. All of the disks are preferably formed of plywood.

The confronting sides of the disks 19 and 20 are covered with heavy paper or plastic sheet membranes 25 and 26 to divide the lower end of the bowling pin into two compartments. These compartments are approximately half filled with sand or similar granular substance 27. The mobile granular substance lowers the center of gravity and also apparently affects the sound as well as bounce and pin pattern. This may be due to an inertia effect.

An alternative structure is shown in FIGS. 4 and 5. In the construction here shown, the plywood disks 18, 19, and 20 are omitted, and instead the bottom member 11 is provided with radiating webs or ribs 28 which join at the center to form a core 29. A center hole or recess 30 is formed in the bottom end of the core 29. The ribs 28 not only reinforce the bowling pin but tend to modify the sound. This construction performed satisfactorily and was close in behavior to the standard wooden pin; however, not as close as to bounce, pin fall, and especially sound as the first described structure. Also, as in the first described structure, sand or other granular material 27 may be added.

The plastic material utilized in the construction of the bowling pin should be tough, slightly resilient, and have good impact characteristics.

It is desirable that the bottom member 11 be somewhat harder than the body member 1. It has been found that the bottom member 11 may have a Shore D hardness of between 55 and 90. A bottom member having a Shore D hardness of 72 has given satisfactory service. The Shore D hardness of the body member 1 may be between 40 and 70. Body members having a Shore D hardness of 47 and 57 have given satisfactory service.

A set of twenty bowling pins constructed as shown in FIGS. 4 and 5, wherein the bottom member had a Shore D hardness of 72 and the body member a Shore D hardness of 57, was used in test on a bowling alley and subjected to 1200 lines (a line representing each ten throws of the bowling ball). After this test the bottom members showed no damage whatsoever; the body members exhibiting a few superficial dents, presumably due to impact by the corners of the bottom members of other bowling pins. However, the dents were not sufficient to constitute damage to the bowling pins. By contrast, wooden bowling pins made of maple would have withstood only 300 to 500 lines, and thus for the same length of service would have had to be refinished two or three times. This would have resulted in a detrimental change in weight and dimension as well as substantial reconditioning expense.

Subsequent tests with the construction shown in FIGS. 1–3 equalled the test with the bowling pins constructed as shown in FIGS. 4 and 5 insofar as withstanding the loads imposed. However, the sound produced appeared closer to the sound of wooden pins. This was confirmed by oscillograph tests. Still further, especially with the addition of the sand, bounce as well as pin fall seemed to approach remarkably close to the action of wooden

bowling pins. This was confirmed to a large extent by high speed photographs of the bowling pins when struck by bowling balls in the course of tests on a bowling alley; and also by "bounce" tests involving pendulum mounting a bowling pin and bowling ball, then striking the pin by the ball with a preselected force. In this regard, tests were conducted by varying the amount of free sand. The resulting bounce tests varied from below that of the range expected of wooden pins when excess sand was used, to above that of such range when the sand was omitted.

In spite of the attempts to determine scientifically the action of the plastic bowling pins, there remains a domain which is dependent on subjective test by the player himself. Repeated tests by bowlers, especially with the construction shown in FIGS. 1–3, however, seemed to confirm the more precise tests. For example, the average score over many games played with the plastic bowling pins and corresponding wooden pins was well within the statistical variation to be expected if only wooden pins had been used. Again, this was especially true of the construction shown in FIGS. 1–3.

It will be observed that the cylindrical disks 18 and 19 are centered substantially in the region of impact, that is, the region in which the bowling ball contacts the bowling pin, thus reinforcing the body member 1.

The accumulative volume of the cavity or chamber provided within the bowling pin is calculated to compensate for the extra density of the plastic material, so that the completed plastic bowling pin will weigh the same as a wooden or maple bowling pin, and within the American Bowling Congress weight limits (2 lbs. 14 oz. to 3 lbs. 10 oz.).

Reference is directed to FIG. 6. Wooden bowling pins are, within about 100 lines of play, "conditioned"; that is, the scatter improves. Externally, the belly of the bowling pin has a curvature centered in a plane about ¼" above the center of the bowling ball. Consequently, there is a slight, but definite, upward component of force when the bowling pin is struck by the bowling ball. Apparently, this is sufficient to lift the bowling pin and adversely affect the scatter.

However, after about 100 lines of play with wooden bowling pins, the region of engagement by the bowling ball becomes flattened so that there is less tendency of the bowling pin to lift and a better scatter occurs.

In the case of the plastic bowling pins herein described, no "conditioning" occurs by reason of engagement by the bowling ball or by interengagement; consequently, it is preferred to provide a cylindrical area 31 in the region extending about ¼" above and below the center line of the bowling ball 32.

While particular embodiments of this invention have been shown and described, it is not intended to limit the same to the exact details of the constructions set forth, and it embraces such changes, modifications, and equivalents of the parts and their formation and arrangement as come within the purview of the appended claim.

What is claimed is:

A bowling pin formed of molded plastic material, comprising: a body member defining externally the belly, neck, and head of a bowling pin, said member having a longitudinal bore enlarged within said belly portion and continuing upwardly therefrom into said neck portion; reinforcing means in said neck portion; a bottom member including a tubular portion arranged initially to telescope within the enlarged portion of said bore and be bonded to the walls thereof, said bottom member also including side walls converging from the lower end of said body member and a bottom wall completing the external contour of the bowling pin, said body and bottom members defining a closed chamber; sound and bounce control means within said chamber including a plurality of annular disks formed of wood and transversely disposed in said chamber, the lower of said disks covered with a membrane to form an upper and a lower compart-

ment; and a mobile material divided between said compartments.

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