July 25, 1967 N. J. HALIP 3,332,685

PLASTIC BOWLING PIN WITH METAL CORE

Filed March 19, 1964

FIG. 1

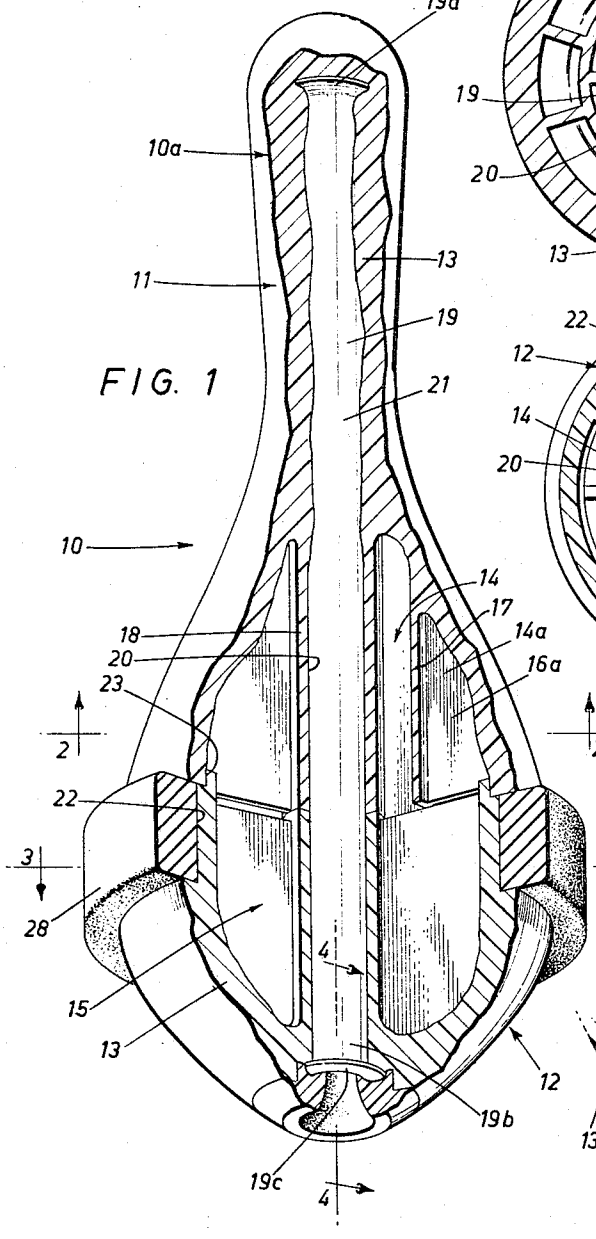


FIG. 2

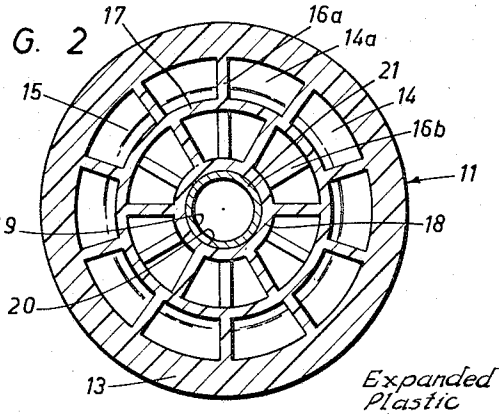


FIG. 3

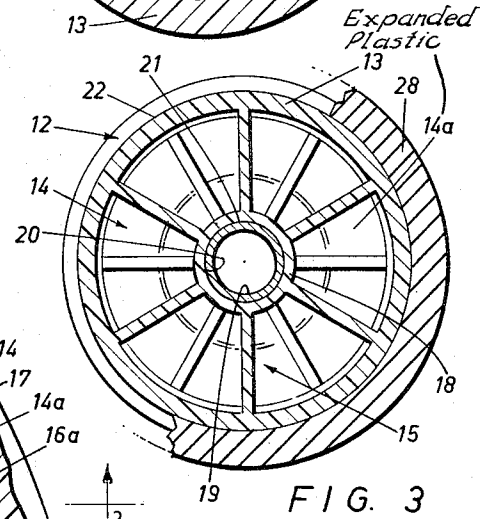
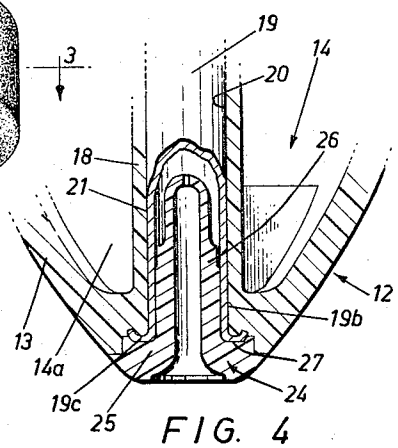


FIG. 4



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PLASTIC BOWLING PIN WITH METAL CORE

Nicholas Joseph Halip, 1907 Arras St.,
Windsor, Ontario, Canada

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This invention relates to bowling pins. More particularly, this invention relates to bowling pins made of plastic which, while possessing a number of the advantages of conventional wooden bowling pins, avoid a number of the more significant disadvantages thereof.

A primary disadvantage of conventional wooden bowling pins is that they may, and often do, vary in weight significantly on account of the non-uniform density of the wood from which they are made. Thus, in order to obtain a set of wooden bowling pins which are even relatively closely matched in weight, it is necessary to manufacture considerably more wooden bowling pins than are necessary for one complete set and to choose bowling pins from these that are as closely matched in weight as possible. This process of selection and matching is time consuming and adds to the cost of conventional wooden bowling pins. Moreover, the set of bowling pins which is obtained often is not a perfectly matched set, and a pin of this set may vary significantly in weight with respect to pins from other sets, which also is an undesirable feature.

Accordingly, one object of my invention is to provide plastic bowling pins which may be made of uniform weight and which do not require subsequent selection and matching.

Another disadvantage of conventional wooden bowling pins is that in normal use they should be replaced at least every year. In many cases more frequent replacement is required. Furthermore, the plastic coating, which is employed on conventional wooden bowling pins for the purpose of protecting the wood, flakes and chips after the pins have been in use for only a matter of weeks. Consequently, such pins require frequent resurfacing.

Accordingly, another object of my invention is to provide plastic bowling pins which will last several times as long as conventional bowling pins and which will require only infrequent resurfacing.

Experience has shown that conventional wooden bowling pins tend to fracture at the heads thereof, because the head is the thinnest and hence weakest part of a wooden bowling pin.

Accordingly, it is yet another object of my invention to provide a plastic bowling pin with a metal core, such a bowling pin having an exceptionally strong head.

It is well known that mechanical pin setters subject conventional wooden bowling pins to wear and cause abrasion and chipping of such pins.

Accordingly, another object of my invention is to provide a plastic bowling pin better able to withstand the abuse of mechanical pin setters.

The source of raw material for wooden bowling pins is limited, and manufacturers of such pins often find it necessary to purchase whole forests well in advance. A forest fire in these forests might well slow down for several years production of wooden bowling pins by the owners of the forests. Furthermore, suitable supplies of wood generally are not available near large manufacturing centers. Consequently, either the wood must be transported to the bowling pin manufacturer, or the manufacturer must locate near his source of raw material. Both of these alternatives create a number of economic problems.

Yet a further object of my invention is to provide bowling pins made of a material which is readily available in large manufacturing centers.

In the production of wooden bowling pins the following steps are required: kiln drying, squaring, turning, smoothing, coating with filler, lacquering and dipping in plastic. Many of these steps require considerable time, and, in a number of cases, considerable time must elapse between steps.

It is a further object of my invention to provide plastic bowling pins which can be made quickly by a simple injection molding process which avoids all of the aforementioned steps.

An additional and important object of my invention is to provide plastic bowling pins which simulate the sound of wood when struck and which are capable of creating the same "action" as wooden bowling pins.

In brief, a bowling pin embodying my invention has plastic side walls which define an interior compartment. A plurality of divider walls divide the interior compartment into a plurality of smaller compartments, the divider walls forming a rigid web supporting the side walls.

My invention will become more apparent from the following detailed description taken in conjunction with the appended drawings in which:

FIGURE 1 is a perspective view, partly broken away, of a bowling pin embodying my invention,

FIGURES 2 and 3 are sections taken along lines **2—2** and **3—3** respectively in FIGURE 1, and

FIGURE 4 is a sectional view showing in greater detail the bottom of a bowling pin embodying my invention.

Turning now to the drawings for a more detailed description of a bowling pin embodying my invention, I have shown a bowling pin **10** which has an upper part **11** and a lower part **12**. Parts **11** and **12** are made entirely of plastic and have side walls **13** which define an interior compartment **14**.

Interior compartment **14** is divided into a plurality of smaller compartments **14***a* by divider walls which form a rigid web **15** in each part **11** and **12**, web **15** supporting side walls **13**.

It will be seen that in the preferred embodiment the divider walls extend parallel to the longitudinal axis of the bowling pin. There are radial divider walls **16***a* and **16***b* and annular divider walls **17** and **18**. Annular divider wall **18** is positioned within and is concentric with respect to annular divider wall **17**. Radial divider walls **16***a* are positioned between side walls **13** and annular divider wall **17**, while radial divider walls **16***b* are positioned between annular divider walls **17** and **18**. Radial divider walls **16***a* are secured to side walls **13** and annular divider wall **17**, and radial divider walls **16***b* are secured to annular divider walls **17** and **18** by virtue of the fact that the whole part **10** including the rigid web **15** is injection molded as a unit, as is the whole part **12**.

A metal core member **19** which is preferably a hollow tube made of aluminum and which is flared or flanged at both ends is secured within bowling pin **10**, the inner surface **20** of inner annular divider wall **18** firmly contacting the outer surface **21** of tube **19**.

Lower part **12** is recessed at **22** and has an annular channel **23** therein. Upper part **11** fits into annular channel **23** as shown, and any suitable means such as a fast drying resin is used to cement parts **11** and **12** together at **23**.

A cap **24** made of a suitable plastic and having a head **25** and a finger **26** is positioned in lower part **12** with finger **26** in tube **19**, finger **26** being press fitted into tube **19**. Head **25** has a channel **27** which accommodates the flanged or flared end of tube **19**.

A number of plastics may be used in practising my invention. Preferably an ABS polymer such as Cycolac (trademark), or an ethyl cellulose plastic such as Ethocel (trademark) should be used.

Acrylonitrile-butadiene-styrene (ABS) plastics are characterized by high impact strength, tensile strength, rigidity and hardness and have a broad range of temperature usefulness. The chemical resistance property of ABS plastics also is very good. The impact resistance of ABS polymers is outstanding. When impact fractures occur, they are ductile in nature and not sharp and brittle, indicating high energy absorption before rupture. The toughness of ABS polymers is not radically affected by orientation, molded-in strain, moisture content, etc.

Ethyl cellulose moldings are characterized by their toughness over a wide temperature range, dimensional stability and freedom from odour. Excellent surface lustre adds greatly to the aesthetic value of articles molded from ethyl cellulose. Ethyl cellulose plastics have a very low density, exceptionally high impact resistance, high heat distortion temperature, high degree of flexibility and good processability.

The provision of rigid web **15** in each part **11** and **12** contributes to the rigidity of bowling pin **10** and assists in the creation of a bowling pin with appropriate "action." Furthermore, the provision of compartments **14***a* within web **15** assists in the simulation of the sound created by a wooden bowling pin. This sound simulation also is enhanced by the fact that tube **19** is hollow. Slight changes in sound effects and perfect weight may be achieved by filling compartments **14***a* with an expanded plastic such as expanded styrene. Pelaspan (trademark) expandable styrene beads may be used, for example.

Tube **19** serves to align upper and lower parts **11** and **12** respectively, holds these parts together, adds strength to the bowling pin, particularly the head thereof, and contributes to simulating the sound of wood.

In manufacturing a bowling pin embodying my invention, upper and lower parts **11** and **12** respectively including webs **15** are injection molded, upper part **11** being molded about tube **19**, so that flange **19***a* thereof is imbedded in the head **10***a* of the bowling pin. Compartments **14***a* in lower part **12** are filled with water and expandable plastic pellets. Upper and lower parts **11** and **12** then are assembled, end **19***b* is flared as at **19***c*, and cap **24** is placed in position. Subsequently the assembled bowling pin is passed through a dielectric heating step where the pellets of expandable plastic are expanded. In this manner the bowling pin is further strengthened. Finally a transfer or decal and stripes may be applied to the pin, and a coat of protective lacquer for the latter applied. It will be appreciated, of course, that a conventional rubber ring **28** will be seated in recess **22**. Because of the nature of the manufacturing process, bowling pins so manufactured will be found to have uniform characteristics.

If it should be necessary to resurface bowling pin **10** at any time, this may be done easily by applying a coat of plastic to the pin. It will be found that this coat will bond better to the plastic bowling pin than to a wooden bowling pin.

Those skilled in the art will appreciate that, while I have described preferred embodiments of my invention, changes may be made therein without departing from the spirit and scope of my invention as defined in the appended claims.

What I claim as my invention:

1. A bowling pin having plastic side walls, said side walls defining an interior compartment; a plurality of divider walls dividing the interior compartment into a plurality of smaller compartments, said divider walls forming a rigid web supporting said side walls and extending parallel to the longitudinal axis of said bowling pin with at least some of said divider walls extending radially, said divider walls including first and second annular divider walls in the interior compartment, said second annular divider wall being positioned within and concentric with respect to said first annular divider wall, first ones of said radially extending divider walls extending between said first annular divider wall and said side walls, second ones of said radially extending divider walls extending between said first and second annular divider walls; and a metal core member mounted within said second annular divider wall and secured within said bowling pin, the inner surface of said second annular divider wall contacting the outer surface of said metal core member.

2. A bowling pin according to claim **1** wherein said metal core member is a hollow tube.

3. A bowling pin according to claim **2** wherein said plastic is selected from the group consisting of acrylonitrile-butadiene-styrene plastic and ethyl cellulose plastic, said bowling pin having at least an upper part and a lower part, said hollow tube joining said parts together and being secured to both said upper part and said lower part.

4. A bowling pin according to claim **3** including an expanded plastic in the interior compartment of said bowling pin.

5. A bowling pin according to claim **1** wherein said metal core member is a hollow aluminum tube.

6. A bowling pin according to claim **1** wherein said plastic is selected from the group consisting of acrylonitrile-butadiene-styrene plastic and ethyl cellulose plastic.

7. A bowling pin according to claim **1** having at least an upper part and a lower part, said metal core member joining said parts together.

8. A bowling pin according to claim **7** wherein said metal core member comprises a hollow metal tube positioned within said bowling pin and having at least two projections extending outwardly therefrom, one of said projections engaging said upper part, the other of said projections engaging said lower part, whereby said tube joins said parts together.

9. A bowling pin according to claim **8** including an expanded plastic in the interior compartment of said bowling pin.

10. A bowling pin according to claim **9** wherein said expanded plastic is expanded styrene.

11. A bowling pin according to claim **8** wherein said projections are flanges formed at the ends of said hollow tube, and wherein said lower part has a recess formed in the bottom thereof, said lower part having a shoulder defining the bottom wall of said recess, said other projection engaging said shoulder, and including a cap fitted into said recess and secured therein.

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RICHARD C. PINKHAM, *Primary Examiner.*