

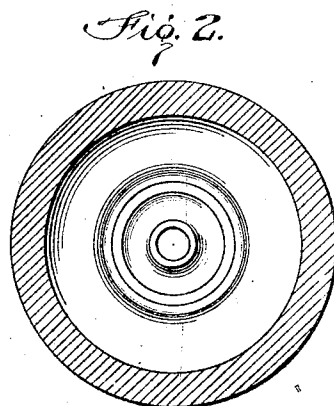
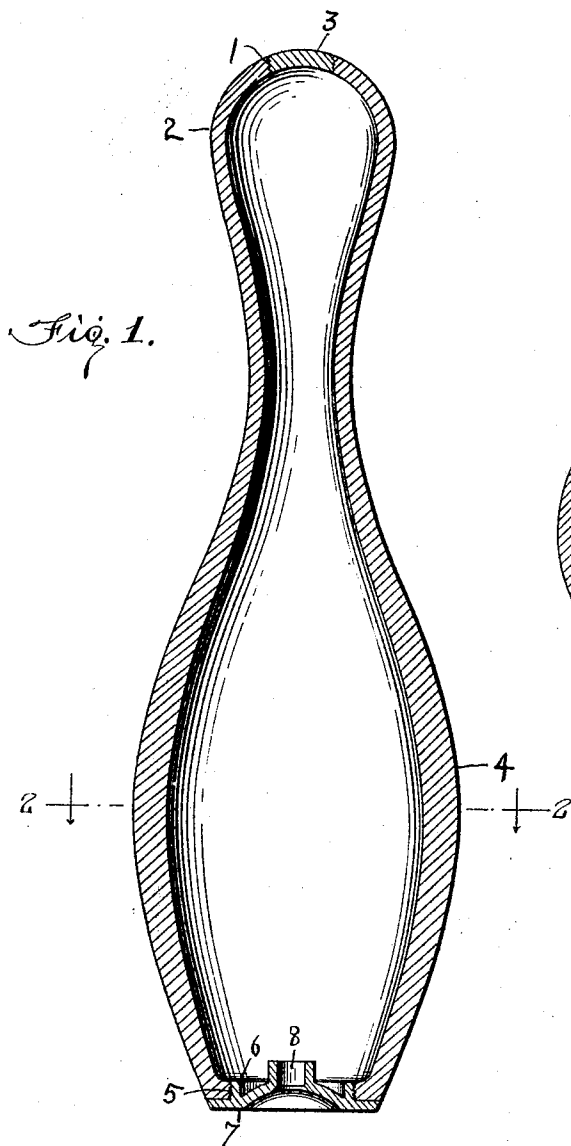
April 22, 1924.

A. M. STEWART

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BOWLING PIN

Filed Dec. 6, 1922



Inventor.
A. M. Stewart,
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UNITED STATES PATENT OFFICE.

ANDREW M. STEWART, OF TOLEDO, OHIO.

BOWLING PIN.

Application filed December 6, 1922. Serial No. 605,311.

To all whom it may concern:

Be it known that I, ANDREW M. STEWART, a citizen of the United States, residing at Toledo, in the county of Lucas and State of Ohio, have invented new and useful Improvements in Bowling Pins, of which the following is a specification.

My invention relates to hollow metal bowling pins.

The object of this invention is to produce a bowling pin composed of hollow metal having the size and shape of standard or acceptable wooden bowling pins, the metal being distributed so that its cross-areas at any selected plane will be approximately the same as the cross-area of a standard or satisfactory wooden pin of the same size and shape at a corresponding plane. In such a metal pin the center of gravity will be at the same point as in the said wooden pin. The weight of the metal and the wood between corresponding planes will be the same, and the cross-areas of the metal and the wood in the two pins at corresponding points will be inversely proportional to the specific gravities of the metal and the wood used.

It is also my object to select a metal alloy that is tough, hard, and elastic, so that it will not dent, chip, crack, or break for a period much exceeding the life of standard wooden pins.

Referring to the accompanying drawing, Fig. 1 is a central longitudinal section of a bowling pin, such as a ten-pin or a duck-pin, constructed substantially in accordance with my invention, and Fig. 2 is a cross-section on the line II—II of Fig. 1.

The bowling pin in the drawing may be considered to have the same length as a standard or selected wooden pin, made for example, of hard maple, and to have the same diameters, circumferences, and cross-areas as the wooden pin at corresponding places. The area of the metal at any cross-section is to the cross-area of the metal pin at the same cross-section (which is the same as the cross-area of said wooden pin at the corresponding cross-section) directly as the specific gravity of the wood is to the specific gravity of the metal. The specific gravity of hard maple may be taken as .68 and that of the proposed metal as 1.85. If the cross-area of the pins at a certain point is 14.8 square inches, the cross-area of the metal at that point should be approximately $68/185$ of 14.8 square inches, or 5.44 square inches. As

the circumference of this cross-area is known, or can be computed, it only remains to ascertain the required thickness of the metal wall at the given cross-section to contain 5.44 square inches.

As the exterior shape and size of my metal pin are those of a selected wooden pin, the variations in the wall thickness are all made by varying the interior surface by keeping it at every point at such a distance from the exterior surface as to meet the foregoing requirements approximately.

The metal I prefer to use is known commercially as Dowmetal, an alloy composed largely of magnesium with small amounts of other metals. It has a specific gravity of about 1.85, a tensile strength of over 20,000 pounds per square inch, an elastic limit of 14,000 pounds per square inch, a Brinell hardness of 56 to 58, and a scleroscope hardness of 28.

It is manufactured by the Dow Chemical Company, of Midland, Michigan. I do not restrict my invention to the use of Dow metal as variations of it and substitutes for it may be used if they have the required characteristics, such as lightness, strength, elasticity, hardness and relatively low specific gravity.

An axial hole 1 is provided in the head 2 of the bowling pin and a plug 3 of the same metal as is used in the head may be screwed into the hole. This hole is provided to facilitate the support of the core of the mold for casting the pin.

The lower end of the bowl 4 of the pin has the threaded hole 5 to receive the threaded boss 6 of the bottom plate 7 made of the same metal as that of the bowl. This plate has provision for fitting a selected type of pin-centering device. For example, the plate 7 may have the hole 8 to receive one of the centering pins of a bowling-pin centering apparatus. Plates adapted to different types of pin centering devices will be provided, and the proper plate for any particular centering apparatus will be secured to any one of my bowling-pins.

In the specification and claims the term bowling-pin is employed to include tenpins, duck-pins, and similar articles.

I claim—

1. A hollow metal bowling pin in which the area of the metal at any cross-section is to the area of the cross-section inversely approximately as the specific gravity of the

metal is to the specific gravity of the wood of which a bowling pin of same size and shape as the metal pin is composed.

2. A hollow metal bowling pin in which the area of the metal at any cross-section is to the area of the cross-section inversely approximately as the specific gravity of the metal is to the specific gravity of hard maple.

3. A hollow metal bowling pin in which the weight of the metal between any two intersecting planes intersecting the same is approximately equal to the weight of the wood between the same planes intersecting a wooden bowling pin of similar size and shape.

4. A hollow metal bowling pin in which the weight of the metal between any two intersecting planes intersecting the same is approximately equal to the weight of the

wood between the same planes intersecting a hard maple bowling pin of similar size and shape.

5. A hollow metal bowling pin in which the center of gravity is at substantially the same point as in a wooden bowling pin of the same size and shape.

6. A hollow metal bowling pin in which the wall at any cross-section taken at right angles with the longitudinal axis of the pin is of uniform thickness and in which the area of the metal at any cross-section is to the area of the cross-section inversely approximately as the specific gravity of the metal is to the specific gravity of the wood of which a bowling pin of the same size and shape as the metal pin is composed.

In testimony whereof I hereunto affix my signature this 23rd day of November, 1922.

ANDREW M. STEWART.