Dec. 25, 1956 K. K. SCHROEDER, SR., ET AL 2,775,456

BOWLING PIN

Filed Dec. 29, 1954 2 Sheets-Sheet 1

Fig. 1

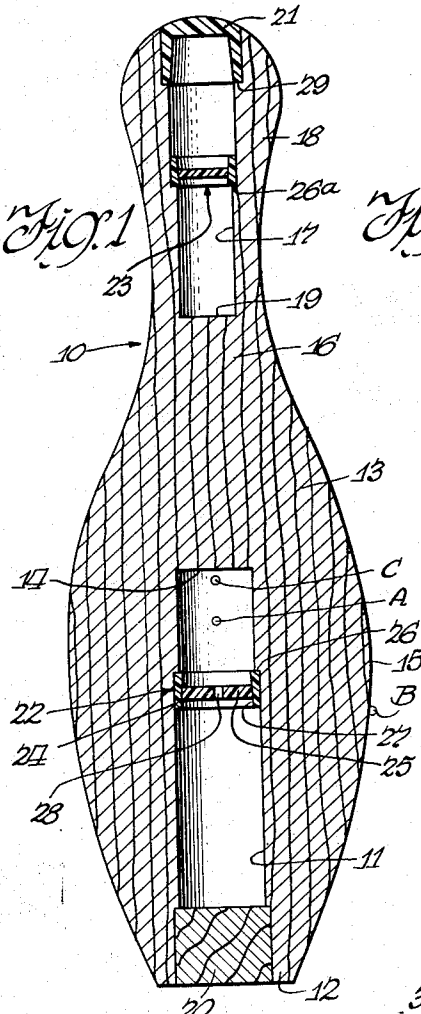



Fig. 4

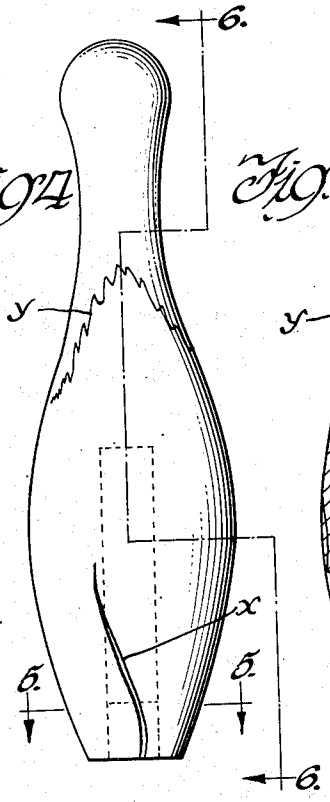



Fig. 6

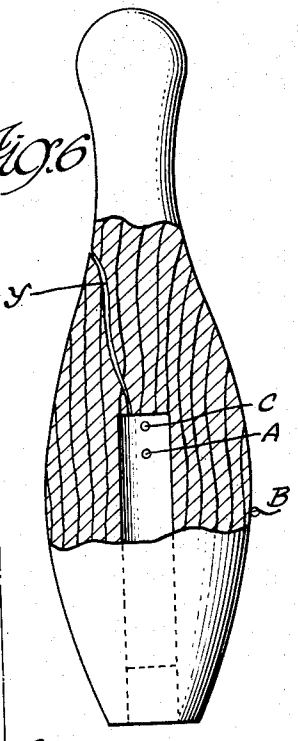



Fig. 3

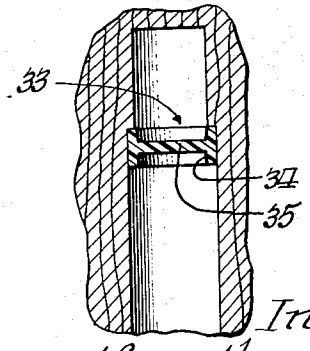



Fig. 5

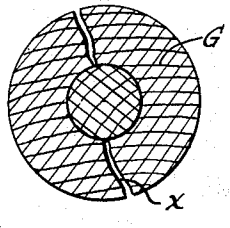
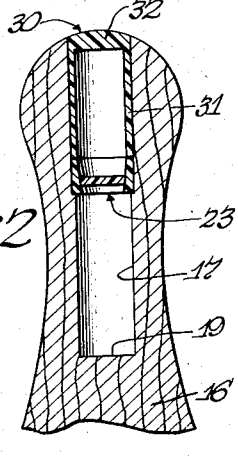



Fig. 2




Inventors
Kenneth K. Schroeder, Sr.
Kenneth K. Schroeder, Jr.
by Kegan & Kipnis
Attys.

Dec. 25, 1956 K. K. SCHROEDER, SR., ET AL 2,775,456

BOWLING PIN

Filed Dec. 29, 1954 2 Sheets-Sheet 2

Fig. 7.

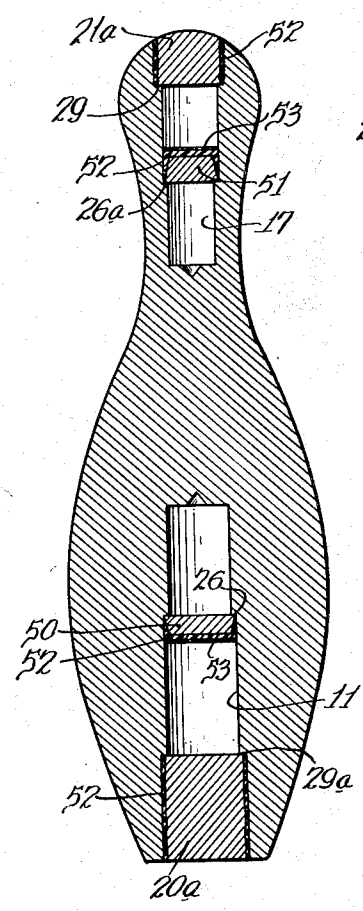



Fig. 12.

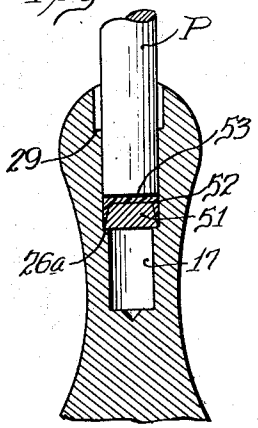



Fig. 8.

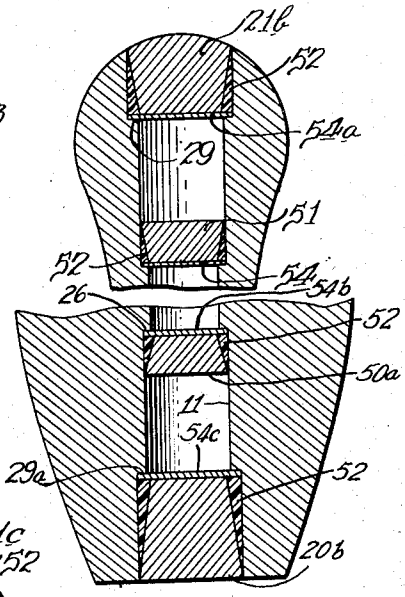



Fig. 9.

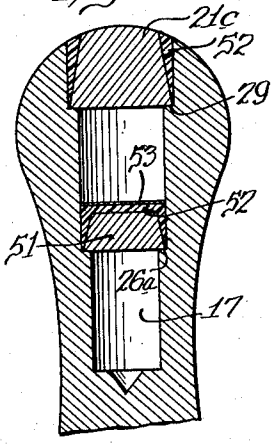



Fig. 11.

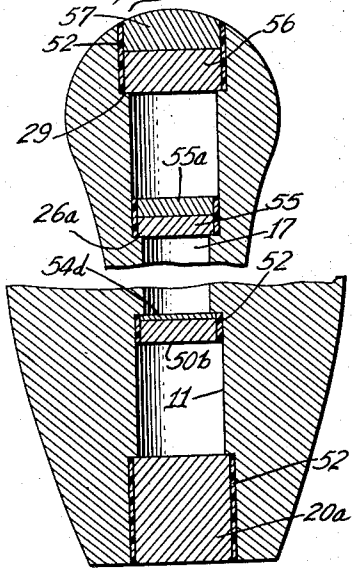
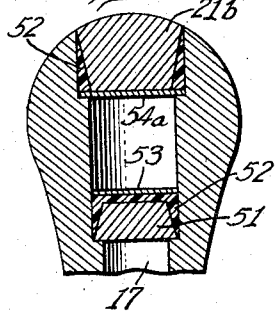



Fig. 10.




INVENTORS.
Kenneth K. Schroeder Sr.
Kenneth K. Schroeder Jr.
By: Kegan and Kipnis
Attys.

United States Patent Office 2,775,456 Patented Dec. 25, 1956



2,775,456

# BOWLING PIN

Kenneth K. Schroeder, Sr., Zion Ill., and Kenneth K. Schroeder, Jr., Kenosha, Wis.

Application December 29, 1954, Serial No. 478,412

3 Claims. (Cl. 273—82)

This invention relates to methods of making controlled weight bowling pins; to novel structures which facilitate practicing said method and make it relatively easy to produce said bowling pins; and to the improved bowling pins produced by said methods.

Among the various properties possessed by or required of bowling pins which are difficult to provide and more difficult to reconcile with one another, the selection of proper material is economically one of the most difficult. This applies mainly in the case of high grade or tournament pins which are made and used in very appreciable numbers, and it applies to some extent also in the case of pins for less exacting requirements, which are made and used in even greater numbers.

Hard maple is invariably used to make the pins in question, this kind of wood being capable of providing adequately light weight for easy scoring and at the same time, adequately high strength for durability. Since the use of such material has become usual, bowlers also request pins which produce the characteristic sound of hard maple when certain impacts occur with the bowling ball or the alley floor. Likewise hard maple has a very characteristic coefficient of friction with conventional bowling alley flooring, the absence of which would affect the behavior of a pin materially. Still further, very definite dimensional and balance requirements must be fulfilled. All these affect the scoring characteristics of a pin.

The specifications set by the American Bowling Congress (ABC) require that regulation pins be made from maple, and that each pin weigh not less than two pounds, fourteen ounces nor more than three pounds, ten ounces. Further, the ABC requires that the weight of regulation pins shall not vary more than four ounces in each set, while the center of gravity of each pin must be between $5\frac{10}{16}$ and $5\frac{15}{16}$ inches from the pin base.

The economic problem is due to the fact that hard maple varies widely in density and other characteristics, as a result of which the bowling pins made therefrom may not meet ABC approval nor score as easily as is desired and required. Pins made from heavy, hard maple and weighing above three pounds, seven ounces are considered as "heavies." Pins of such type, and those which do not score easily for other reasons, cannot be sold at premium prices and sometimes cannot be sold at all.

For these reasons attempts have been made in the past to produce so-called "controlled weight pins" by the expedient of drilling out portions of the body of the pin, that is, sinking a drill hole into the base of the pin and actually into the belly of the pin; subsequently reclosing the base opening of the drill hole by a suitable plug with or without special pin-setting facilities.

However, such weight control as heretofore applied has solved only mild problems of excess weight and unbalance. When either the length or mainly the diameter of a bottom drill hole was made large enough to achieve,



for instance, sufficient weight reduction for substantial excess weight, difficulties were encountered. An obvious difficulty was that the required static balance of the pin was destroyed. For this reason alone, the controlled weight method has made little if any headway up to now. Less obvious, but equally serious, was the fact that impact balance, durability, sound effects and other properties of the pin were unfavorably influenced. Seemingly obvious answers were found inconclusive and unsuitable. For instance, it is of course well known that a pin can be reinforced by suitable hoops around the base or the belly or both, but problems such as balance, friction and the like are so seriously aggravated by such remedies that in practice nothing is achieved thereby, mainly in the case of tournament pins and pins of a grade approaching tournament characteristics.

It has occurred to us that heavies may be converted into regulation weight pins by hollowing out their head as well as their base, mainly when combining these operations with another novel step to solve the special and novel durability problem created by the new weight control procedure.

Accordingly, a primary object of this invention is to provide statically and dynamically balanced controlled weight bowling pins having an appreciably longer life than heretofore possible.

This application is a continuation-in-part of our copending application Serial No. 401,497, filed December 31, 1953, and now abandoned.

The details of and interrelationships between these problems and procedures will be understood more clearly upon a study of the following description of preferred embodiments of the present invention.

In the drawing:

Figure 1 is a central vertical section through a bowling pin constructed in accordance with this invention.

Figure 2 is a central vertical fragmentary section through a slightly modified embodiment.

Figure 3 is a central vertical fragmentary section through another modified embodiment.

Figure 4 is a side elevation of a controlled weight pin not constructed in accordance with the present invention, showing certain cracks which tend to form in such pins.

Figure 5 is a section through the pin of Figure 4 along the line **5—5** in Figure 4.

Figure 6 is a fragmentary section through the pin of Figure 4 along the line **6—6** in Figure 4.

Figure 7 is a central vertical section through a bowling pin having a further modified construction.

Figures 8 to 11 are central vertical fragmentary sections through slightly modified embodiments.

Figure 12 shows one method of setting inserts in the bowling pin.

Referring to Figure 1, the new pin has a body **10** of hard maple. A drill hole **11** of relatively well known type for weight control, but of relatively great diameter and also fairly great length is centrally and axially drilled into the base **12**. This hole extends into the belly **13** of the pin and to a region or top end portion **14** which is well above the widest part **15** of the body, although substantially below the neck **16**.

In addition a drill hole **17** is centrally and axially formed in the head **18** of the pin, starting from its top and extending downwards to a bottom area **19** which is located above and preferably only slightly above the narrowest part of the neck **16**; the diameter of the upper drill hole **17** being approximately equal to half or almost half the narrowest diameter of the neck.

In experimenting with upper drill holes **17** of progressively greater depth and diameter, we found, in accordance with the basic idea that occurred to us as noted

above, that rather substantial amounts of material can thus be removed. Originally when the idea of any such hollowing out of the head was considered and discussed by us, a question had been raised whether the head of the pin is not such a frail and delicate part as to make this operation precarious. However, we found that such was not the case; that on the contrary the regions of basic weakness lie in the upper part of the body below the neck and in the base region of the pin. Thus we discovered that even greater weight control and balance control is possible by the hollowing out of the head than we had originally hoped for. The weight control is further augmented by the fact that in order to balance the removal of material from the head, the bottom hole can be enlarged. Previously, as mentioned, no bottom hole of appreciable size could be formed because of balance difficulties and durability among others. Actually, the depth of each hole may be varied slightly in order to maintain proper balance control.

We expected from the start that appreciable enlargement of the bottom hole **11** would lead to secondary problems of durability, sound, etc. We found this confirmed, but found it possible to deal with such problems in a fairly simple manner.

Referring now to Figures 4 to 6, we believe the durability problems of controlled weight pins, which have been mentioned above, will be understood more clearly when consideration is given to the following further details, which will also clarify some of the particular features and advantages of the new design.

Experience has shown that all bowling pins have a tendency to develop cracks X starting at the base and progressing upwards upon repeated impacts, but particularly when, after the formation of a beginning crack X, the pin is so positioned that such a crack is oriented laterally rather than in the line of impact. Further experience has shown that all bowling pins have a tendency also to develop cracks Y starting adjacent the narrower part of the neck and progressing downwards when a pin and mainly the head of a pin has been impacted with the floor or ball or other pins, with excessive force, in a number of instances.

We have found that the insertion of reinforcing inserts in the pin body prevents the occurrence of cracks X. Further, because hole **11** may be made shorter by removing weight from he head of the pin, the hole is removed from the area of weakness wherein cracks Y tend to form.

The pin **10** is shown as being provided with a simple bottom closure plug **20** in and for the bottom end of the drill hole **11**. This plug is shown as being made of wood, preferably of hard maple similar to that used in the body of the pin in order to leave the coefficient of friction unchanged. The plug as shown has a length approximately equal to its diameter in order that it may be bonded to the insides of the bottom hole **11** with sufficient adhesion in spite of the vibrations of the material, induced by impacts of bowling balls, which vibrations are substantial in this area. Also in order to control such vibrations, the plug **20** is preferably solid as shown.

A closure for the top hole **17** is shown at **21**. Again it has a side-wall length approximately equal to its diameter in order to insure adequate bonding to the inside of the pin. At this point, of course, no problem of friction is involved; therefore the top closure **21** can be made in the form of a hollow cup or nipple of synthetic plastic or other suitable materials.

We have shown an insert member **22** inserted in the bottom hole **11**, across the axis of the pin, at an elevation between the top end **14** and the bottom plug **20** and preferably adjacent the elevation of the point B where the bowling ball applies an impact force to the belly **13** of the pin. This impact point B is located adjacent to and slightly below the area **15** of greatest peripheral width, which in turn is located below the center of



gravity A of the bowling pin. We expected that by means of such an insert the pin can be more effectively protected against breakage and also against an undesirably hollow impact sound, and we have found this confirmed in practice.

Similarly we have shown an insert **23** for the top hole **17**, inserted between the bottom end **19** and the top closure **21** of this hole. While, as mentioned, we found the head much less of a problem than originally expected, with regard to basic strength, we did find that durability as well as sound effects are improved by this additional insert. It will be understood of course that the impacting of the head with other solid objects—the floor, the ball or other pins, occurs a split second after the impacting of the ball with the point B.

Each insert **22** and **23** as shown consists of a short ring **24** equipped with a transverse plate or web **25**. The ring **24** is inserted in the respective drill hole and bonded to the inside wall of such hole by a suitable binder. The location of the insert is preferably controlled by providing a shoulder **26** in the weight control drill hole, at the predetermined location for the forward end of the ring **24**. After the insertion of the ring **24** and prior to any taking of a set in the binder employed, the plate **25** is forced forwardly into the ring **24**, the inside wall of which is therefore shown as having a suitable taper **27**. Some little deformation of the ring **24** can and should occur incident to the forcing in of the plate **25**; this is important because the inside of a drill hole in a body **10** of wood cannot be mathematically or accurately circular because of the different effects of edge grain and flat grain upon the drilling tool. The irregularities caused by such effects are simply and adequately compensated for by the two-piece insert as shown. All parts of the insert installed in the pin are exposed to a compression stress, the magnitude of such stress being different along different radii, but positive and adequate contact being made with the wood along the entire periphery of the insert. We found that without such provision, a relatively hollow sound develops and, in aggravated cases, an undue tendency toward crack formation and splitting is encountered.

These objectionable features and dangers are fully avoided by the inserts **22** and **23**. Of course the two parts of each insert are bonded together, as well as the outer part **24** being bonded to the wood, pursuant to application and wedging in of the plate **25**. The plate **25** can be provided with a small central hole **28** in order to facilitate removal of inserts in the event that an improperly drilled out pin is encountered in the manufacturing process.

Also to be noted is the fact that we provide a pair of annular shoulders **26***a* and **29**, in the upper hole **17**, and a pair of annular shoulders **26** and **29***a*, in the lower hole **11**. Each shoulder not only serves to position the respective insert or plug set thereon, but also provides a means to achieve stronger binding between the separate elements. In each hole, the deeper shoulder can be formed by drilling a hole to the required depth, then drilling a concentric hole of greater diameter, from the desired point of the shoulder outwardly. The shoulder is formed at the juncture of the two diameters. The second, or shallower shoulder can be similarly formed by drilling a third concentric hole of greater diameter than the second.

Since the deeper annular shoulders **26** and **26***a* function to support and secure the inserts, their position depends on where the inserts are to be placed. In the lower hole **11**, the optimum position of the insert is just below the widest part **15**, of the pin, thus enabling positioning of insert **22** adjacent the elevation of the point of bowling ball impact. In the upper hole **17**, the insert is usually placed halfway down the hole.

Positioning of the outer annular shoulders **29** and **29***a* is determined by the length of the plugs which they sup-

port. The distance of each shoulder **29** and **29***a* from its respective bowling pin end is substantially the diameter of the plug supported thereon, since the length of each plug should at least approximate its diameter in order to achieve proper binding between pin and plug.

Referring to Figure 2, closure elements such as a top closure **21** can be modified in various respects. With regard to pin centering holes and reinforcements for the same, in the bottom closure **20**, a number of constructions are known which need not be discussed herein. With respect to the top closure, it may be noted that when a relatively short closure is used as in Figure 1, it is necessary or at least desirable to provide a shoulder **29** for the forward end of this closure, in addition to the shoulder **26***a* for the forward end of the top insert **23**. Figure 2 shows a top closure **30** having a side wall **31** which extends downward from the top of the head to the backward or upper end of the top insert **23**, whereby any second shoulder can be dispensed with and the closure can be installed so that its top **32** is accurately in line with the top of the wooden body **10**.

Referring now to Figure 3, it is also possible to make a top or bottom insert in the form of a one-piece plastic molding **33** instead of the two-piece combination **24**, **25**. In other words, the ring **34** can be made integral with the transverse plate or web **35**. One advantage of this is that fewer parts are involved.

Since ordinary binders, such as glues and cements, dry and shrink, they introduce stresses which tend to weaken the bowling pin; while wedging the plugs or inserts into the holes also tends to weaken the bowling pins, or even may cause a fracture. Further, precise machining of the holes is not only expensive, but difficult as well. Therefore, undesirable notches and crevices often are inadvertently cut, and the result is that there is not a good binding surface between the plugs or inserts and the side walls of the holes. Moreover, the inaccessibility of such notches or crevices makes them hard to work on in order to eliminate them as possible stress and strain concentration points.

We have found, therefore, that by surrounding each plug or insert with a binding agent having high impact strength and shock absorbing qualities, other modifications of our invention function even better than those disclosed hereinabove. Such a binding agent also must be capable of surrounding the plug or insert and filling in undesirable notches, and be moldable in place. To eliminate brittleness, a plasticizer incorporable with a monomer should be used to form the binding agent.

We have found that methyl methacrylate resin powder, when dissolved in a monomeric solution of the same and to which a plasticizer has been added, is admirably suited for use as the adhesive impact-resistant binder substance. We have also found that polyvinyl acetate emulsions, rubber cements and the like can be used.

Referring now to Fig. 7, a tapered wood dowel **50** is snugly pushed onto the deeper shoulder **26**, formed in the lower hole **11**. A plastic binder substance **52** is then poured into the side space around the dowel **50** and also over its top. Cellophane **53** is placed over the plastic on this top surface. A snugly fitting but slidable plunger P is introduced into the hole and brought into contact with the cellophane **53**, which prevents the plastic from sticking to plunger P. The pressure brought by plunger P onto the plastic binder forces the binder to completely surround the dowel and fill in any notches, while eliminating air pockets and other possible sources of weakness. The plunger is then removed and the plastic is permitted to set. The upper insert **51** is set in the pin in a similar manner.

Figure 7 also shows that the bottom closure plug **20***a* and the top closure plug **21***a* are roughened and their diameters slightly less than the diameter of the hole portion wherein they are placed. In addition, the walls of the holes in the area of the plugs, that is, from the outer



shoulders to the surface, are also roughened. The plugs are dipped into the plastic binder **52** and are inserted into their respective holes to form a closure. When the binder sets, not only is the adhesion of the plug increased, but greater impact absorbing qualities are produced in the pin by the use of wooden dowel inserts and plugs and the binder. Actual tests have shown that controlled weight bowling pin life has been increased from about 1500 lines to over 3000 lines, or approximately doubled.

In Figures 8 to 11, other modifications of the insert and plug are shown. While the drawings are of only the top portion of the pin, it is to be understood that the same arrangements and procedures may be followed in the pin base also.

Figure 8 illustrates a tapered dowel inserted with its smaller surface facing inwardly of the pin. A thin disk **54** is first set onto the deeper shoulder **26***a*, preventing dowel **51** from slipping below the shoulder while also acting to reinforce the pin structure. A small amount of binder **52** is poured onto disk **54** and then dowel **51** is pushed into place. The compression of the binder between disk **54** and dowel **51** forces binder **52** into the space at the side of the dowel where it sets to an impact resistant substance.

In Figure 8, a tapered closure plug **21***b* is also seen with its smaller surface facing inwardly of the pin. This plug also rests on a thin disk **54***a* set on the upper shoulder **29** in the hole. Binder substance **52** is poured onto disk **54***a* and when the plug **21***b* is inserted, the binder flows to its side where it hardens and provides the same effect as it does with the roughened plug. At the same time, the resiliency of binder **52** adds to the shock absorbing qualities and hence the life of the pin.

Similarly, the pin base portion is fitted with a disc **54***b* at shoulder **26**, and onto disc **54***b* there is placed a tapered reinforcement insert **50***a*; while, at shoulder **29***a*, a disc **54***c* is set thereon with a tapered closure **20***b* positioned on disc **54***c*. Binding of insert **50***a* and closure **20***b* to the walls of passage **11** is accomplished in the same manner as for dowel **51** and plug **21***b*.

An advantage of using tapered inserts and plugs is that they are self-centering. That is, the largest diameter of each is substantially equal to the diameter of the hole portion wherein it is placed. In such a manner, binder **52** is equally distributed about the peripheral sides of the plugs and inserts, in turn equalizing the shock absorbing qualities throughout the respective transverse plane wherein each lies.

In addition, plug **21***b* is rounded to form a finished closure in the bowling pin head. It also should be noted that when either the plug or insert is converging inwardly, as shown in Figure 8, they act as their own plunger to distribute the binder about their sides, thereby eliminating the necessity of using cellophane.

Considering both the upper and lower plugs and inserts, many possible arrangements as to the facings of the tapered surfaces are possible. Using only the top part of the pin, Figures 9–11 illustrate some possible combinations. The numbers in these figures refer to the same structures shown in Figures 7 and 8.

Figure 9 shows the insert **51** and a plug **21***c* with their sides converging towards the outer end of the pin. When molding insert **51** in this position, the same procedure is followed as that described for setting it as shown in Figure 7. Binding closure plug **21***c* to the pin requires that it first be inserted into position with its largest diameter resting on shoulder **29***a* and against the side walls of the hole portion wherein it is placed. This assures that no plastic binder will flow into the hollowed pin portions. Next, binder **52** is poured into the spacing between plug **21***c* and the sidewalls and permitted to harden, after which the excess binder is removed from the head of the pin.

Figure 10 at the pin head portion shows the plug and insert with their tapered sides converging in opposite di-

rections. The method of setting them in the pin is evident, however, from the hereinabove disclosure, and thus will not be elaborated upon.

Figure 11 shows one preferred embodiment of the invention, wherein a first reinforcing insert **55** is placed upon shoulder **26***a*, and the plastic is poured in the top of insert **55**. A second insert **55***a* is then plunged onto the plastic, forcing it around the sides of both inserts **55** and **55***a* to bind them to the pin. Next a reinforcing disc **56** is placed upon shoulder **29**, and plastic is poured onto the top of disc **56**. A closure **57** is then plunged down onto the plastic which is forced to the sides of disc **56** and closure **57**, binding them to the pin. The same procedure and structure may, of course, be used in the pin base. Thus, the pin base portion, for example, may have a closure plug **20***a*, described hereinbefore, while using a reinforcing insert or disc **54***d* at shoulder **26** to position cylindrical insert **50***b* thereat. To bind disc **54***d* and insert **50***b* to the walls of passage **11**, disc **54***d* is first placed on shoulder **26**, afterwhich plastic is poured thereon. Insert **50***b* is plunged down onto the plastic, forcing it around the sides of disc **54***d* and insert **50***b* to bind them to the pin.

Considering that plugs and inserts may be placed in both the base and the head of the pin, many possible arrangements of the tapered surfaces are possible.

The invention is not intended to be limited to the specific structures described above. Since it may be described in a variety of expressions, it is to be understood that the embodiments herein described are for the purpose of illustration only, and not intended to limit and define the invention. For example, the pin structure is readily adaptable to instances where the holes in either or both the head and base are continuously tapered and wherein tapered plugs and inserts are fitted to add strength and shock absorbing qualities to the pin.

We claim:

1. A weight controlled bowling pin comprising a wooden bulk including body, neck and head portions; an axial passage extending upwardly from the pin base and ending past the widest part of said body portion; a second axial passage extending from the top of said head portion downwardly, ending in the region of the neck portion to provide both predetermined weight and predetermined balance to said pin; a closure at the outer end of each passage providing a surface continuous with the surface of said pin; said closure being tapered and converging toward the center of said pin; a tapered strengthening insert set in said first passage at an elevation substantially that of bowling ball impact with said body portion; and a shock absorbing plastic binder surrounding the sides of said closures and said insert and binding each to the wall of the respective passage wherein it is set.



2. A bowling pin as described in claim 1, and additionally including an annular shoulder in said first passage and a disc positioned at said shoulder, reinforcing said pin, and engageable by said insert for the location thereof substantially at said elevation of bowling ball impact.

3. A weight controlled bowling pin comprising a wooden bulk including body, neck and head portions; an axial passage extending upwardly from the pin base and ending past the widest part of said body portion; a second axial passage extending from the top of said head portion downwardly, ending in the region of the neck portion to provide both predetermined weight and predetermined balance to said pin; a closure at the outer end of each passage providing a surface continuous with the surface of said pin; a strengthening insert set in said first passage at an elevation substantially that of bowling ball impact with said body portion; each of said passages being circular in cross-section, and each of said closures and said insert being circular in cross-section and having a diameter less than that of the passage wherein it is placed; and a shock absorbing cement bonding the sides of each of said closures and said insert to the wall of its respective passage.

**References Cited** in the file of this patent

UNITED STATES PATENTS

| | | |
|---|---|---|
| 1,170,339 | Romunder | Feb. 1, 1916 |
| 1,520,109 | Bishop et al. | Dec. 23, 1924 |
| 2,053,382 | Stickley | Sept. 8, 1936 |
| 2,517,116 | Klinger | Aug. 1, 1950 |