APPARATUS FOR MAKING SHUTTLECOCKS

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1. My invention relates to an apparatus for making a shuttlecock or as generally termed a "bird" and used in the playing of games such as badminton, and the like.

It has been the practice in manufacturing such birds to shape the sponge rubber base or body thereof in a suitable mold but considerable trouble has been experienced with the molds now in use because of the difficulty in forming the upper or inner portions of the base or body in which the quill portions of the feathers are inserted and thereafter stripping the base from the mold. Also due to the fact that the blowing of the rubber had a tendency to form a dent or pocket in the nose of the body or base of the bird, accuracy in flight was decreased.

One of the principal objects of the present invention is to overcome the first above mentioned objection by providing my improved apparatus with means whereby feather receiving openings will be accurately formed in the base or body during the molding thereof.

Another object of the invention is to eliminate the formation of such pockets or dents by providing the mold with means for permitting the escape of air or gasses released under heat by the blowing agent employed in making the rubber body or base.

Another object of the invention is to provide a simple apparatus or mold in which birds can be manufactured with speed and economy.

Still further objects and advantages of the invention will be apparent as the specification is considered with the accompanying drawings, in which:

Figure 1 is a plan view of the complete mold;
Figure 2 is a section on line 2—2 of Figure 1;
Figure 3 is a section on line 3—3 of Figure 1;
Figure 4 is a fragmentary view of the mold base member showing one of the mold cavities therein;
Figure 5 is a fragmentary view of the intermediate mold plate showing the arrangement of one set of pins used in forming the feather receiving openings in the base member of the birds;
Figure 6 is a fragmentary view of the top plate of the mold showing one of the cores or cavity forming members;
Figure 7 is a front view of the stripper mechanism employed in carrying out my improved method and showing the intermediate section or plate of the mold inserted therein preparatory to stripping;

Figure 8 is an end view of Figure 7;
Figure 9 is an enlarged fragmentary detail view of the complete mold with a rubber blank in place preparatory to forming the base member of a bird;

Figure 10 is a view similar to Figure 9 showing the final form assumed by the rubber blank when the mold is subjected to heat;

Figure 11 is a transverse section through a base member of a bird, formed in my improved mold, after the base member has been stripped and before the feathers have been applied; and

Figure 12 is a sectional view through a completed bird made according to my improved method.

Referring more particularly to the drawing M denotes a metal mold especially designed to make the shuttlecock or bird disclosed in my Patent 2,217,032 and pending application Serial No. 703,158, filed October 14, 1946. The mold consists of a bottom or base member 1, an intermediate plate 2 and a top or core plate 3, all preferably made of Duralumin and adapted to be assembled in the superposed relationship best shown in Figures 2 and 3 of the drawing. The base member 1 is formed with any suitable number of hemispherical cavities 4, open at their upper ends and leading from the bottom of each cavity is a small downwardly and outwardly tapering air escape hole or passage 5, the purpose of which will be later explained.

The intermediate plate 2, is formed with a plurality of apertures 6, corresponding in number to and registering with the cavities 4, in the base 1, when the mold members are assembled, this operation being facilitated by the use of dowel pins 7, only one of which is shown. Seated, as by press fit, in each of the apertures 6 is a metallic ring 8. These rings 8, preferably of Duralumin, project slightly below the bottom face of the plate 2 and seat against shoulders 9, formed in the top face of the base plate 1, surrounding the open ends of the cavities 4. This provides less metal contact which in turn offers a better seal-off and prevents overflow of stock at that point during molding operations. Peripheral recesses 12 and 13 formed respectively in the top face of the base 1 and top face of the plate 2 provide spaces for the insertion of a suitable tool (not shown) for prying the mold members apart, as will be explained hereinafter.

Each of the aluminum rings 8 is provided in its lower face with a plurality of downwardly and inwardly inclined openings 14 of a size to snugly receive a plurality of steel pins 15, preferably six-
een in number and having tapered outer ends 16. These pins are of such length that the tapered ends will extend to a point close to the bottom of cavities 4, as best shown in Figure 3.

The plates 1, 2 and 3 are each rectangular in shape and of increasingly greater length in the order named, that is, top plate 3 is slightly larger than the other two, and the intermediate plate is slightly larger than the base plate, the purpose of this being to facilitate the handling of the mold members during the assembling and disassembling of the various parts of the mold. Projecting from the bottom face of core number 3 are a plurality of cores 17, one for each cavity 4, so spaced that they will pass through the rings 8 and extend into the cavities 4, when the mold members are assembled.

When the mold just described is used in the manufacture of the body portion 20, of a bird 18, such as disclosed in Figure 12 of the foregoing, a cube 19 of pure gum sponge rubber (see Figure 9) is placed in each of the cavities 4 and thereafter the intermediate plate 2 and top plate 3, either collectively or in the order named, are superposed upon the base member 1. The assembled parts are then placed in a conventional steam press or cooker, not shown, where the rubber cubes are subjected to suitable melting and vulcanizing temperature. The melted sponge rubber is thus caused to rise or expand, within the confines of the mold, and to finally assume the shape of the body portion 20, best shown in Figure 11. It might be noted here that the sponge rubber cube 19 contains a suitable amount of blowing agent, such as soda. By regulating the amount of blowing agent used the size of the cell structure is correspondingly increased or decreased and a product of the desired firmness obtained.

The sponge rubber flows around the beveled ends of the cores 16 to provide the integral circular walls 21 and the cavities 22. At the same time downwardly and inwardly inclined openings 23 are formed in the wall 21 as the material flows around the steel pins 14. These openings 23 are adapted to receive the quill portion 25 of feathers 25, which are inserted by hand, after the body portions 20 have been stripped from the pins 14 in a manner described hereinafter. Where a solid body 20 is desired, that is, one in which the cavity 23 is eliminated, it is merely necessary to reduce the length of the beveled ends of the cores 17.

After the body members 20, have thus been formed the mold members 1, 2 and 3 are piled apart by means of a suitable tool, not shown, which is inserted first in one of the recesses 12-13 and then in the other. The body members 20 of the birds, which remain attached to the intermediate plate 2, must now be stripped from the latter. In order to facilitate this operation I provide a metal stand 26, provided with parallel channel-iron track members 27, supported by legs 28 and open at their forward ends to slidably receive therein the reduced ends of the intermediate plate 2. When the plate 2 has been firmly positioned in the tracks 27 over a hopper 29 and a preferably rectangular plunger or punch block 31, of any suitable material such as metal or wood, is employed to remove the body members 20. The block 31 carries a plurality of pins 32, equal in number to that of the apertures 6 in plate 2, and adapted to be inserted through the latter. It will thus be seen that when the pins 32 are placed in the corresponding holes in the plate 2 and forced downwardly by the operator, all the body members or bases 20 will be released with one motion or operation to drop down through hopper 29 and finally into the container 30. The body members 20 are now ready for the final manufacturing operations including the insertion of feathers 25 in the openings 23. The slightly tapered outer ends 16 of the pins 15 cause the lower ends of the quill openings 23 to be correspondingly tapered and this aids greatly in securely anchoring feathers in the box. Suitable power means may be employed to actuate the punch plate or this may be done by hand.

When the soda in the rubber starts to blow during the molding operations it has a tendency to form an air pocket which in turn results in the base of the body becoming dented to such an extent that the true flight of the bird is interfered with. This objection has been eliminated to a large extent by providing the base member 1 of the mold M with the small air escape holes 5, previously mentioned, leaving from the bottom of cavities 4 and flared at their outer ends as at 33. During the process of curing the base or body portion 20 of the bird, some of the rubber flows down into this air escape passage 5 and when the base is removed, the little bit thus formed escapes and leaves the cavities 4 completely full with rubber. The excess rubber eventually becomes clogged and necessitates cleaning with a brush or other means before completion of a run.

In order to overcome the forementioned difficulty the base or bottom member 3 of the mold M is provided with longitudinally extending grooves 34 and transverse communicating grooves 35 respectively. The excess rubber is thus provided with four avenues of escape from the bottom of each cavity 4. Likewise the gas can follow the grooves in four different directions and completely leave the mold, whereas without these grooves the rubber occasionally comes loose at the point 5 and completely seals the bottom of the mold to the steam press, which would form a vacuum and render the air jet useless.

Having thus described my invention, I claim:

1. A mold for making shuttlecocks comprising superposed top, bottom and intermediate metal members joined together, the bottom member formed with a plurality of semi-spherical cavities projecting therefrom, and said cavities having apertures therein registering with said cavities, a plurality of pins supported by said intermediate members and projecting downwardly and inwardly into said cavities, said top member having core members projecting through said apertures and into said cavities in spaced relation to said pins, and the top face of the bottom member and top face of the intermediate member having recesses providing spaces for the insertion of a suitable tool for prying the mold members apart said top and intermediate member having their ends overlapping with respect to each other to facilitate handling of the mold members.

2. A mold for making shuttlecocks comprising superposed top, bottom and intermediate metal members, the bottom member formed with a plurality of semi-spherical cavities, said intermediate member having apertures therein registering with said cavities, a plurality of pins supported by said intermediate member and projecting downwardly and inwardly into said cavities and said top member having core members projecting through said apertures and into said cavities in spaced relation to said pins, and the top face of the bottom member and top face of the intermediate member having recesses providing spaces for the insertion of a suitable tool for prying the mold members apart said top and intermediate member having their ends overlapping with respect to each other to facilitate handling of the mold members.
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spaced relation to said pins, the bottom, intermediate and top members being rectangular and of increasingly greater length in the order named, to facilitate handling of the mold members, and the top face of the bottom member and the top face of the intermediate member having recesses providing spaces for the insertion of a tool for prying the mold members apart.

ATWOOD M. TIMPÉ.

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