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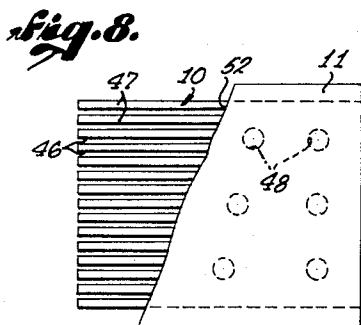
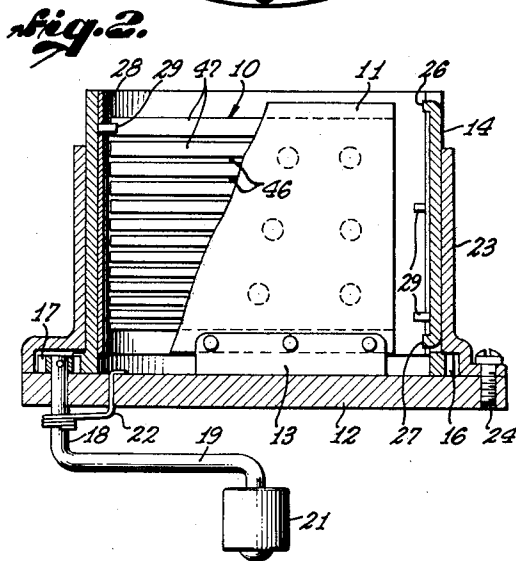
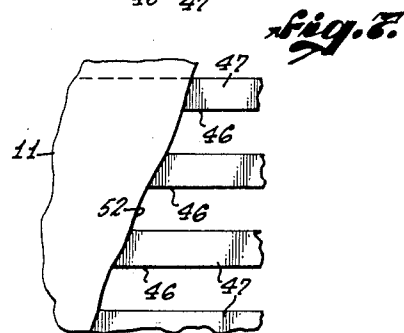
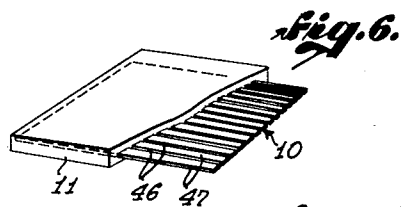
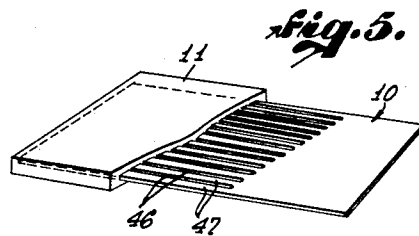
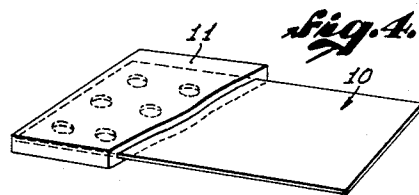
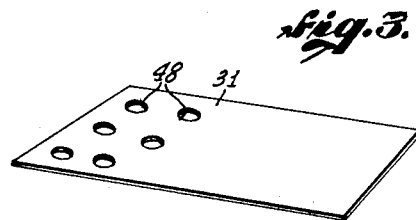
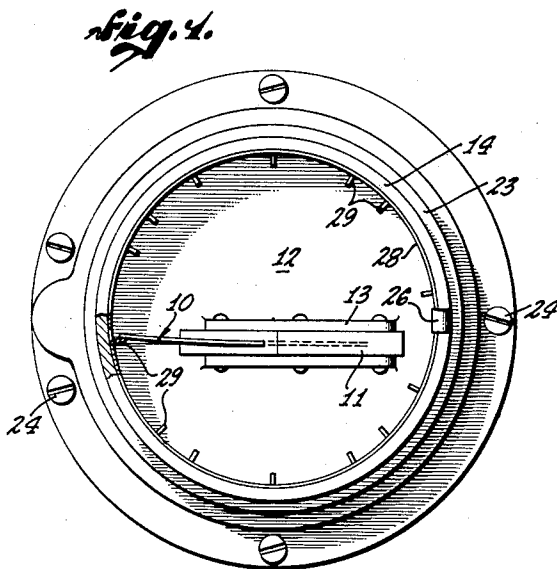
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METHOD OF MAKING A MUSICAL COMB

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2 Sheets-Sheet 1



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METHOD OF MAKING A MUSICAL COMB

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2 Claims. (Cl. 29—529)

This invention relates to a new and improved method of making a musical comb.

More particularly, the invention relates to such a method of making a musical comb as is particularly adapted for use in a music box or the like substantially corresponding to commercially available music boxes preferably of the Swiss type, but incorporating features of novelty and advantage referred to in my co-pending application, Serial No. 393,694, filed November 23, 1953, of which the instant application is a continuation in part.

Music boxes known to the prior art have employed wires, reeds, flat or round, and other vibrating fingers having a free end and a secured end normally clamped or cast into a base itself comprising or in turn secured to a sounding board. Occasionally, the vibrating fingers or reeds were formed from a sheet metal section by die stamping, cutting, or trimming and filing the individual reeds by hand to achieve true desired tones. Hand trimming and filing are employed particularly in the production of the well-known Swiss musical combs designed for incorporation into Swiss music boxes commercially available throughout the world.

The Swiss musical combs are commercially acceptable in tonal quality but they have recently been unable to compete from a cost standpoint with the mass-produced combs of American manufacture which though they improve upon other prior art devices suffer from a somewhat inferior tonal quality relative to the Swiss musical combs. The most popular current American product employs piano wires instead of the relatively flattened reed-like forms exemplified by the Swiss type comb.

It has long been thought that the sheet formed combs generally analogous to the Swiss type combs and made from a sheet of springy material would have a wide market and satisfy a long felt need if they could be produced by satisfactory economical mass production methods without unduly sacrificing accuracy of tone. Consequently, numerous efforts have been and are being made in the United States and elsewhere to achieve a musical comb construction of commercially acceptable tone quality by means of economical and accurate mass production methods. Thus far, however, no successful die stamped sheet metal or other mass produced comb has been developed which is capable of matching the hand tuned qualities of the Swiss musical combs.

More specifically, mass production has failed to achieve a sufficiently accurate cutting or forming of the vibrating teeth or reeds to give a commercially acceptable tone and especially has mass production failed to evolve such a comb consistently and repeatedly during production. This has largely been due to the inability to cope with those slight variations and tolerances in the cutting or forming of the teeth which are immediately reflected in variation and impairment of the desired true tone of the teeth.

Considerable difficulty, on the other hand, is encountered in initially cutting the teeth for a metal-stamped

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comb when the casting operation follows the cutting of the teeth. Die costs are high, and since the mating die surfaces are critical, undesirable flash forms at the parting line of the die and around the teeth of the comb. Also, material tolerances, alone or when combined with necessary die tolerances, are an invitation to variations, flash and other difficulties which impair the resultant desired purity and uniformity of tone.

In view of the above considerations, among others, it is an object of this invention to provide an economical and acceptably accurate new and improved method for manufacturing the comb on a commercial mass production basis which will as closely as possible approximate the accuracy and quality of hand tuned musical combs now commercially available but at appreciably higher manufacturing cost and consumer prices.

Another object of this invention is the provision of a new and improved continuous method for the efficient and effective manufacture of musical combs of the desired character described.

Another further object of this invention is the provision of appropriate commercial procedures and methods for casting a base integrally with a sheet of resilient comb stock and cutting the teeth of a musical comb from such comb stock with such accuracy and efficiency as to permit the satisfaction of a long felt want therefor.

Yet another object of this invention is the provision of a new and improved method of making a musical comb to such an excellent standard of tonal quality as will compare favorably with prior art hand tuned devices of analogous character.

It is moreover among the objects of this invention to provide a new and improved method of achieving the herein stated objects and to provide improvements over prior art devices and methods heretofore intended to accomplish generally similar purposes.

Other objects and purposes will become apparent from the following description considered in the light of the accompanying drawings wherein like parts are illustrated by like reference numerals.

In the drawings:

Figure 1 is a plan view of a preferred form of music box incorporating a comb embodying this invention and made by the method of this invention.

Figure 2 is a vertical sectional view of said music box of Figure 1.

Figure 3 is a perspective view of a sheet of comb stock designed for incorporation into the comb of this invention.

Figure 4 is a perspective view showing a further step in the formation of a comb embodying this invention.

Figure 5 is a perspective view of a still further step in the formation of a comb in accordance with the structure and method of this invention.

Figure 6 is a perspective view of a completed comb embodying this invention.

Figure 7 is a fragmentary detailed view of the comb of Figure 6 in plan view.

Figure 8 is a plan view of the comb of Figure 6.

Figure 9 is a plan view of the interior of a mold, one-half being removed showing the same as it would appear on the parting line thereof.

Figure 10 is a sectional view of the mold of Figure 9 taken as on a line 10—10 of Figure 9.

Figure 11 is a sectional view taken longitudinally through a cutting die showing punching knives in position relative to a comb blank in the stage of completion corresponding to the comb blank of Figure 4.

Figure 12 is a similar view to Figure 11 but showing the knife punch in a different operative relationship more advanced from that shown in Figure 11 and correspond-

ing to the operation resulting in the comb blank of Figure 5.

Figure 13 is a sectional view taken as on a line 13—13 of Figure 12.

Figure 14 is a fragmentary plan view of a comb blank corresponding to Figure 5 resulting from the position of the die of Figures 12 and 13.

Figure 15 is a fragmentary perspective view of another form of comb embodying this invention.

Referring more particularly to the drawings which set forth by way of illustration but not of limitation a comb and method of making the same embodying this invention, I first describe generally a music box environment for the comb of this invention in order to indicate an operative environment therefor.

In said drawings a comb 10 comprising a cast base 11 is operatively mounted as on the bottom 12 of a frame defining a music box housing. Such securement of the comb may be as by means of a bracket 13 or the like secured as by rivets to the base 11 of the comb which in turn is firmly or integrally correspondingly affixed to the bottom 12.

Also supported on the bottom 12 of the music box is a cylindrical drum 14 having external gear teeth 16 formed around its lower end. The drum 14 is adapted for rotation relative to the frame and bottom 14 by a pinion 17 keyed to the end of a shaft 18 appropriately journaled in the bottom 12. The shaft 18 includes a suitable crank and handle 19 and 21, respectively. A wire 22 may be wrapped several times around the shaft 18 and may have a free end forced through an aperture through the bottom 12 and bent on the inside of the bottom to retain the wire in position. The wrapping of the wire 22 about the shaft 18 provides a desired clutching action to permit free rotation of the shaft 18 in a predetermined direction but to resist counter rotation thereof.

Also supported on the bottom 12 is a cylindrical shell 23 comprising a portion of the frame of the music box. Such shell 23 may be secured to the bottom 12 as by screws 24. Such shell 23 serves to journal the cylindrical drum 14 for rotation therein and relative to the bottom 12. Said shell may be of any desired height or may be omitted altogether in accordance with the teachings of my co-pending application above referred to.

In the instant embodiment, however, and fixedly held within the cylindrical drum 14 is a cylindrical band 28 optionally releasably held as by means of bosses 26 and 27 formed on the drum 14. The band 28 is provided internally with a series of plucking protuberances 29 which preferably are formed on the band 28 by punching the material forming the projections 29 inwardly. The arrangement and sequence of the protuberances 29 are such that depending upon the pitch and arrangement of the various teeth of the musical comb, a pre-selected melody can be played in a manner well known to those skilled in this art.

The cylindrical band 28 is preferably removable from the cylindrical drum 14 so that other band members may be substituted readily and thereby provide for a variety of different tunes to be played upon the same music box and comb.

Having thus described generally an optional form of music box adapted to receive the comb of the instant invention, I will now describe in more detail the comb itself and the method of making the same which again by way of illustration and not of limitation comprise the herein described and claimed invention.

The prior art now knows the continuous feeding of wires into a mold and the forming of a casting around the ends of the wires in the mold followed by the ejection of the casting which draws additional lengths of wire into the mold for successive corresponding molding, cutting and withdrawing steps. I have adapted a continuous method as shown in Figures 9 through 13

for the optional formation of my improved comb. This continuous method comprises forming a long strip of springlike sheet stock 31 and feeding the same into one side of a mold such as an injection mold 32.

As the strip of comb stock is fed into the mold, the two sides 33 and 34 of the mold are closed against one another as guided on guide rods 36. After closing the mold, die casting metal is forced under pressure around the metal 31 into an accurately formed molding cavity to form the base of the musical comb and a confronting adjacent tooth-forming stock portion or blank corresponding thereto.

Ejection of the casting optionally in the direction of the arrow in Figure 9 in a subsequent stage of the comb forming operation will in the use of the instant continuous ribbon fed method be accompanied by the shifting of the entire ribbon 31 in said direction of the arrow to bring a fresh portion of the ribbon corresponding to another comb blank into the mold.

The casting 11 forming the base is firmly secured on the blank 31 and such securement is enhanced by the provision of holes 48 or other openings cut into the blank 31 prior to the molding operation, through which holes the die cast body is continuous from side to side of the comb blank. Now the ribbon 31 is cut as by means of a knife 49 to sever a comb 10. The cutting operation accomplished by the knife 49 may be made in connection with the mold 33 but the cutting of the teeth of the comb preferably comprises a separate accurate cutting operation accomplished on a separate accurate die.

This latter tooth-cutting operation is accomplished preferably when the halves 35a and 35b of an optional separate cutting die 35 are closed and held in registry as by locating pins 37. In said closed position of the die halves, knife receiving slots 41 formed in parallel relationship in the die half 35a are in registry with corresponding knife receiving slots 42 formed in the die half 35b.

A plurality of knife punches 43 mounted as in a movable die holder 44 for slidable, carefully guided reciprocal movement within the die guide slots 41 and 42 are forced downwardly through the blank 31 to form parallel slots 46 thereby defining reed forming lands 47.

It is of particular importance to note that the respective knives 43 have flat bottom edges and that the knives fit accurately within the slots 41 and 42 of the respective die halves. It is also important to note that the blank 10 or 31 is firmly held between the die halves so as to resist any tendency to cause the same to shift.

Said bottom edge 50 of the respective knives 43 is slanted as shown most clearly in Figures 11 and 12. Thus, one edge 51 of the knives is sharp and constitutes a leading edge which is designed and adapted to closely match and preferably touch along but not cut into the preferably sinuous inner confronting edge 52 of the casting 11 forming the base of the comb. Thereby the reeds 47 are individually separated from one another at their fixed ends and when caused to vibrate will vibrate independently of one another without interference. Moreover, it is important to note as seen most clearly in Figure 13 that the blank 31 is supported on spaced shoulders 53 and 54 on the respective die halves 35a and 35b. When the knives 43 descend their first point of contact is with the blank 31 immediately adjacent and preferably in touching relationship to said sinuous inner confronting edge 52 of the cast base 11 of the comb. The knives thus penetrate immediately adjacent to the base 11 and as the knives descend further they shear and cut the grooves 46 simultaneously but in a direction away from the base 11. Said base 11 assists in retaining an accurate positioning of the blank 31 within the cutting dies. However, the essential support of the blank against the cutting thrust of the knives 43 is upon the shoulders 54 which in spaced relationship along the face of the die half 35b provide, with respect to each slot 46 cut in the

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blank, parallel opposed shoulders firmly and accurately locating the knives and sustaining their thrust.

Thus as the blank is cut to form the slots 46, the sheet of metal comprising the same is supported with respect to each knife 43 along to two spaced parallel shoulders 54. No substantial dependence is placed upon the casting 11 to sustain the thrust of the knives and no corresponding shoulder is positioned at the outer end 55 of the respective slots. Consequently, there is no opposing pressure tending to position the blank or support against the knife thrust except along lines parallel to the proposed slots 46. Since these are cut simultaneously and since their shear is along parallel lines, it has been found that exceeding accuracy is obtainable in defining the desired pre-determined widths of the respective teeth 47. It has also been found that such accuracy can be maintained within such close tolerances that a fine tonal quality in the resultant comb is achieved.

The lengths, widths and thicknesses of the respective reeds 47 can be predetermined relative to any desired material within the skill of the art.

In view of the stated desirability of supporting and shearing along laterally spaced parallel shoulders 54, it is possible to form the comb species of my co-pending application above referred to with great accuracy by the instant method. It is also possible and with what I believe to be greater individual tonal fidelity without blending of the vibrations of adjacent reeds to form a comb of the embodiment of Figures 1 through 14 of the instant application when the confronting edge 52 of the casting forms a sinuous outline whose configuration and direction assist in governing the pitch of the respective reeds.

It is also possible in the practice of the instant invention to form a stepped base 51 wherein the individual reeds enter or emerge from the cast base on individual parallel planes normal to the axis of the respective reeds.

The form of comb of Figure 15 embodies such a stepped construction and is intended to teach those skilled in the art the scope of permissible variation in carrying out the teaching of this invention. In said Figure 15 the cast base is designated by the numeral 60; the individual teeth by the numeral 61; the uncut base of the comb blank by the numeral 62; the holes in the blank by 63; and the perpendicular steps normal to the respective reeds by the numeral 64. In the form of comb shown in Figure 15 the uppermost edges there shown of the reeds lie in the plane of the side edges 65 of the steps 64. Depending upon the configuration of the die and the cavity defining the casting 60 as well as the shape of the knives 43 any form of sinuous line or stepped construction may be employed and the reeds 61 may originate in the centers rather than at the edges of the respective steps.

As heretofore mentioned, it is not necessary that the cutting operation by virtue of the knives 43 be accomplished in a different die from the molding operation resulting in the case base 11 or 60. Blanks in lieu of the knives 43 may be inserted on either side of the dies to fill the slots 41 and 42 adapted to accommodate the knives until the molding of the cast base 11 is completed in a mold constructed also as a die like the die 35. In either event, the respective blanks in their form illustrated in Figure 4 whether removed from the mold or die or not for cutting of the blank to its condition in Figure 5 are preferably placed in a further die or jig for accurate trimming of the teeth lengths, i. e., from their condition shown in Figure 5 to their completed condition shown in Figure 6.

The base 11 should be formed of a castable material

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whose melting point, when considered with the molding pressure, will be insufficiently high to affect the desired temper of the sheet of resilient material or blank around which it is formed. Within these limitations the comb forming material, while preferably of a spring-like material such as beryllium copper, may be of other springy substance such as spring steel, or the like. A zinc alloy of commercially acceptable quality for forming castings in commercial practice has been used to advantage, particularly with sheets of beryllium copper.

This invention features the provision of a new and improved die cast stamped melody comb having a metal body, preferably sheet metal, molded integrally with a castable base preferably of zinc alloy, thereby combining the best features of maximum surface displacement of air and form of the Swiss musical combs with desirable mass production methods of the character disclosed and claimed to fulfil the purposes of the objects herein stated. This invention more specifically features the initial intimate casting of a base about a sheet of resilient stock and thereafter supporting the same in a manner to permit cutting of the teeth from positions substantially flush with the die-cast base, resulting in reeds projecting effectively independently from the casting so as to give purer tones.

It will be understood that many variations in the sequence and details of the steps of making the comb of my invention will appear to those skilled in the art, and will be desirable in making combs for different types of music boxes. The foregoing description is explanatory and is given primarily to illustrate a specific embodiment of the comb and method of the invention. Accordingly, it is understood that such changes and modifications in details of the method of invention may be made within the scope of the appended claims without departing from the spirit of the invention.

I claim:

1. The method of forming a melody comb comprising the steps of; perforating one end of a sheet of springlike material between the sides thereof, forming a base of castable material around said perforated end portion in intimate contact therewith, including forming an irregular edge on said base confronting the remaining portion of said springlike material, thereafter punching a plurality of parallel spaced slots into said remaining portion starting from starting positions substantially coincident with said confronting edge and progressing outwardly toward the other end of said sheet but stopping short thereof, and finally severing said sheet transversely thereof in a common line across said slots.

2. The method of forming a melody comb as defined in claim 1, said slots being punched by a shearing action commencing at said confronting edge in a downward direction and including supporting said sheet continuously along the edges of said respective slots while cutting said slots.

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