Nov. 26, 1929. L. T. FREDERICK 1,737,455

METHOD OF FORMING GEAR BLANKS AND THE LIKE

Filed March 11, 1927

FIG. 1.

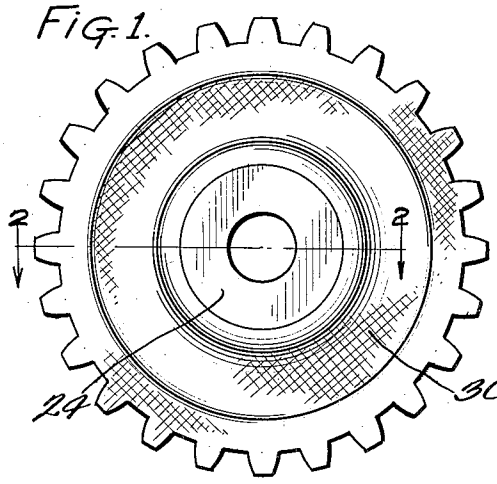



FIG. 3.

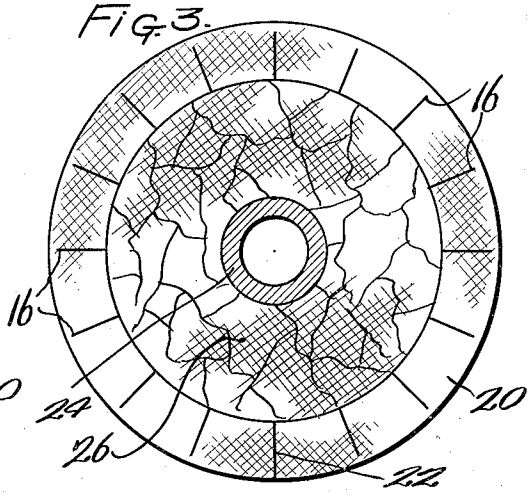



FIG. 2.

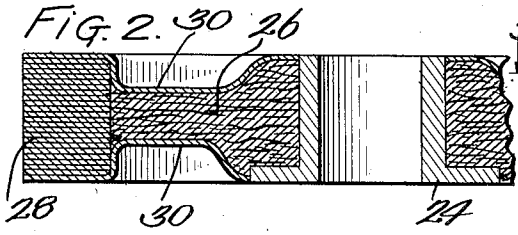



FIG. 4.

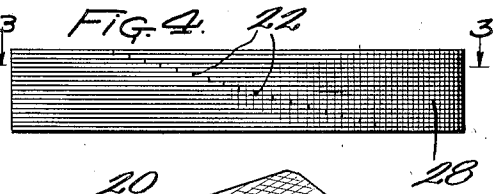



FIG. 5.

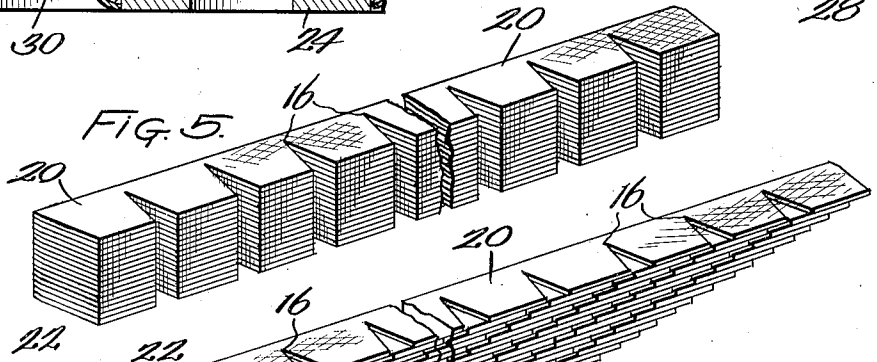



FIG. 6.

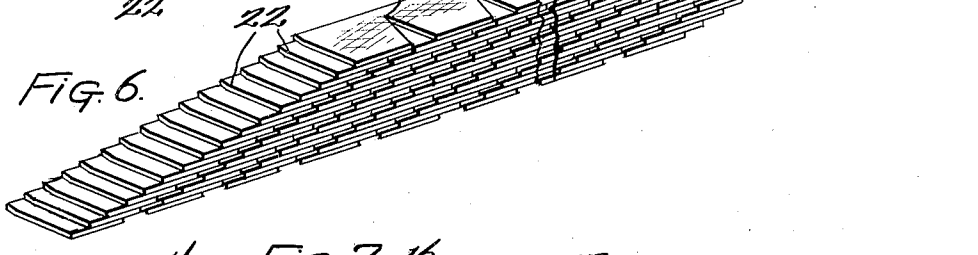
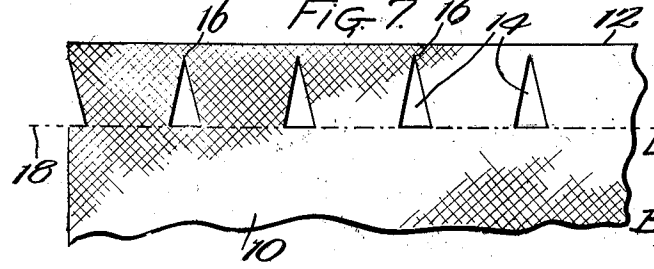



FIG. 7.




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# UNITED STATES PATENT OFFICE

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## METHOD OF FORMING GEAR BLANKS AND THE LIKE

Application filed March 11, 1927. Serial No. 174,688.

My invention relates to the process of forming composite articles and more particularly to the process of forming machine elements, such as gear and pulley blanks from composite material.

The object of the invention is to facilitate manufacture and to provide a simplified, efficacious and cost reducing method of producing such elements in which the rim portion is laminated and the remaining portion is composed in whole or in part of molding material. While molding materials of different forms may be employed, a desirable one consists of small pieces of fabric which have been treated with a condensation product, such as Bakelite in unreacted form. Another object is to obtain maximum strength, particularly in the rim portion, and to make sure that the slits in the individual laminations will be out of register.

To assist in explaining the invention reference is made to the accompanying drawing in which

Figure 1 is a side view of a finished gear provided with side plates of sheet material.

Figure 2 is a section on line 2—2 of Figure 1.

Figure 3 is a view similar to Figure 1 showing a blank without side plates of sheet material.

Figure 4 is a side view of the pile of strips when arranged arcuately.

Figure 5 is a view of the pile of perforated strips before being fanned.

Figure 6 is a view of the pile of strips after being fanned; and

Figure 7 is a plan view of a pile of sheet material showing the manner of cutting the V-shaped holes and severing the strips from the sheets.

In carrying out my invention according to the preferred plan I take sheet material, preferably woven fabric, which has been treated with a condensation product in unreacted form and allowed to dry. I then lay a number of these sheets 10 in a pile with their ends substantially flush with each other, that is, coterminous. I then pass the pile of sheets under a gang punch with the edge 12 of the sheets disposed so that when the punches descend they will cut substantially V-shaped or wedge-shaped holes 14 in the marginal portions of the sheets of the pile. The holes have their apices 16 spaced from the edge 12 of the sheets. I prefer to arrange the sheets relatively to the line of descent of the cutters so that the apices are slightly spaced from the edges 12. Other shapes of cuts may be made, but I prefer the V-shaped hole because such shape best permits the strips to be bent into arcuate formation. If slits instead of holes are cut the edges of the slit portions can overlap when the strip is bent arcuately. I then cut the pile of sheets along a line 18 parallel with the marginal line 12. This line of cut 18 not only forms the pile of strips 20 but also by intersecting the holes or cutouts 14, forms the strips with the ends of the holes or slits opening onto the margins of the strips as clearly shown in Figure 5 of the drawings. In this manner the holes which are formed in the strips extend substantially the width of the strips. I have discovered that by forming the holes of such relative width they permit the most advantageous bending and arrangement in the circumferential portions of the mold, especially where each strip is bent into ring shape with its opposite ends adjacent.

After the pile of perforated or slitted strips is thus formed I fan or stagger them as shown in Figure 6 of the drawings. This fanning operation is preferably done while the strips are arcuately positioned in the mold, although it may be done before the strips are so positioned. By fanning the pile of strips the holes 14 and ends 22 of the strips 20 are staggered and overlapped as shown in Figure 4. After the strips are positioned in the mold, weighed amounts of molding material are placed in the mold to form the web portions of the blank. This molding material preferably consists of wood flour, paper or chopped fabric, pre-treated with condensation product, preferably Bakelite. The chopped fabric is formed by treating sheets of woven fabric with condensation product, allowing it to dry and thereafter chopping it up.

When the strips and molding material are properly positioned in the mold they are sub-

jected to heat and pressure to form them into the completed blank as is well known in the art.

In Figure 2 of the drawings I have shown a section of a completed blank having a metal hub 24, a web portion 26 of molded material, and a rim portion 28 of the perforated strips, all united in a single, consolidated mass by heat and pressure acting upon the condensation treated material, and there being no line of cleavage between the molded material and the strips. In this blank the upper and lower faces of the web and rim are faced with woven sheet material 30 also pretreated with condensation product and consolidated with the material of the blank by heat and pressure. The use of these facing plates 30 is not essential but is desirable because of the finished appearance produced.

By the use of my improved process of forming the strips of condensation treated material from the sheets I am able to manufacture these blanks very economically and in the minimum of time. There is very little waste, and by forming the holes when the material is in piles of sheets of extended area the holes are more easily cut and without danger of the holes slipping out of registration laterally. Furthermore by this arrangement the cutting operation which severs the strips from the sheets also completes the formation of the open-ended holes. In this manner of forming the piles of strips, the strips may easily be handled and fanned to bring about overlapping of the ends and slits when the strips are positioned in the mold.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. In the method of forming composite articles, the steps of forming a stack of strips of sheet material with spaced notches arranged so that the base of the notch is open at the margin of the strip and the apex of the notch is spaced from the opposite edge of the strip, and arranging the strips arcuately and shifting them endwise with respect to each other to thereby close the notches and bring them out of register with each other.

2. In the method of forming composite articles, the steps of forming a pile of relatively narrow strips of sheet material with spaced V-shaped holes, with the apices of the holes slightly spaced from one edge of each strip and with the base of the holes opening onto the other edge of each strip, and thereafter fanning the strips to stagger the holes and ends of the strips.

3. In the method of forming composite articles, the steps of forming a pile of relatively narrow strips of sheet material with spaced V-shaped holes, with the apices of the holes slightly spaced from one edge of each strip and with the base of the holes opening onto the other edge of each strip, and arranging the strips in the peripheral portion of a circular mold with the planes of the strips lying parallel to the plane of the mold, and with the strips fanned so as to place the holes and ends of the strips in staggered relation.

4. A composite article having at its peripheral portions a pile of strips of sheet material disposed in arcuate formation, each strip in the pile having a plurality of slits spaced apart longitudinally of the strip and with each slit extending outwardly and having its outer end slightly spaced from the outer edge of the strip and with its inner end intersecting the inner edge of the strip, said pile of strips being arranged in staggered relationship whereby to law the ends and slits of the strips of the pile and means for holding the strips together in relatively staggered relationship.

5. A composite article having at its peripheral portions a pile of strips of sheet material disposed in arcuate formation with the opposite ends of each strip adjacent each other to form a substantial ring, each strip in the pile having a plurality of slits spaced apart longitudinally of the strip, each slit extending outwardly and having its outer end spaced from the outer edge of the strip and with its inner end intersecting the inner edge of the strip, said pile of strips being fanned whereby to stagger the ends and slits of the strips of the pile and means for holding the strips together in relatively staggered relationship.

6. A composite article having a peripheral portion formed of a pile of strips of sheet material arranged in arcuate formation, the opposite ends of each strip being arranged in contiguous relationship to form a substantially annular ring, each strip having a series of slits formed therein at spaced intervals and spaced from the inner edge of the strip to adjacent the outer edge and the adjacent strips of said pile being arranged in relatively staggered relationship and means for holding the strips together in relatively staggered relationship.

7. A composite article having a peripheral portion comprising a pile of strips of sheet material, each strip being curved to form an annulus and having opposite ends abutting, said strips having spaced slits arranged therein and extending from one edge of the strip to adjacent the other edge, and adjacent strips of said angular portion being arranged in staggered relationship and means for holding the strips together in relatively staggered relationship.

8. In the method of forming composite articles, the step of forming a stack of strips of sheet material provided with spaced registering slits extending from an edge of each strip to a point spaced from the opposite edge and the step of shifting the individual strips

endwise with respect to each other to thereby bring the slits out of register.

9. In the method of forming composite articles, the step of forming a stack of strips of sheet material provided with spaced registering slits extending from an edge of each strip to a point spaced from the opposite edge, the step of shifting the individual strips endwise with respect to each other to thereby bring the slits out of register and the step of arranging the pile of strips arcuately.

10. In the method of forming composite articles, the step of forming a stack of strips of sheet material impregnated with a suitable heat curing binder in unreacted form and provided with spaced registering slits extending from an edge of each strip to a point spaced from the opposite edge and the step of shifting the individual strips endwise with respect to each other to thereby bring the slits out of register.

11. In the method of forming composite articles, the step of forming a stack of strips of sheet material impregnated with a suitable heat curing binder in unreacted form and provided with spaced registering slits extending from an edge of each strip to a point spaced from the opposite edge, the step of shifting the individual strips endwise with respect to each other to thereby bring the slits out of register, the step of arranging the pile of strips arcuately, and the step of compacting the arcuately arranged strips together under heat and pressure.

In witness whereof, I have hereunto subscribed my name.

LOUIS T. FREDERICK.