Sept. 14, 1937. W. C. GRAY 2,093,167

FORMING DIE MEANS

Filed Feb. 4, 1935 2 Sheets-Sheet 1

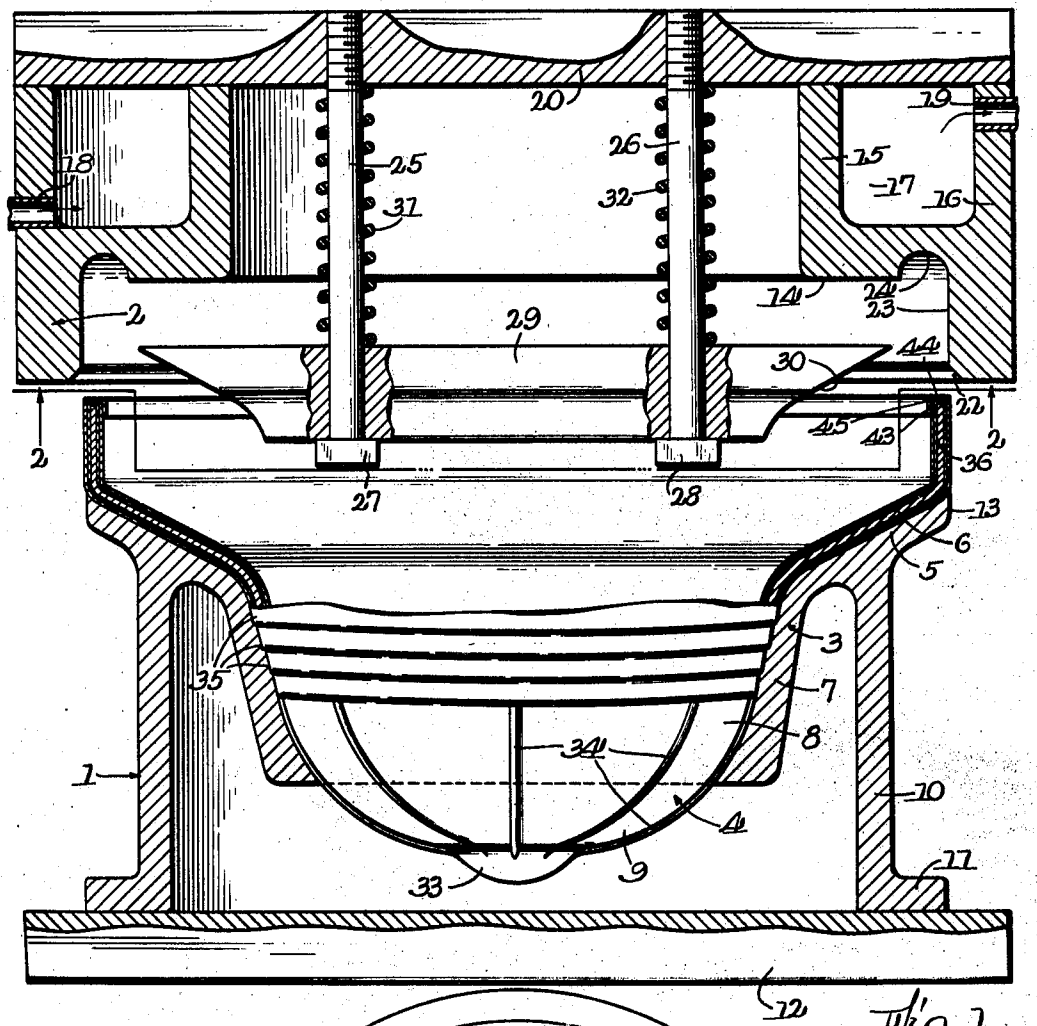


Fig. 1.

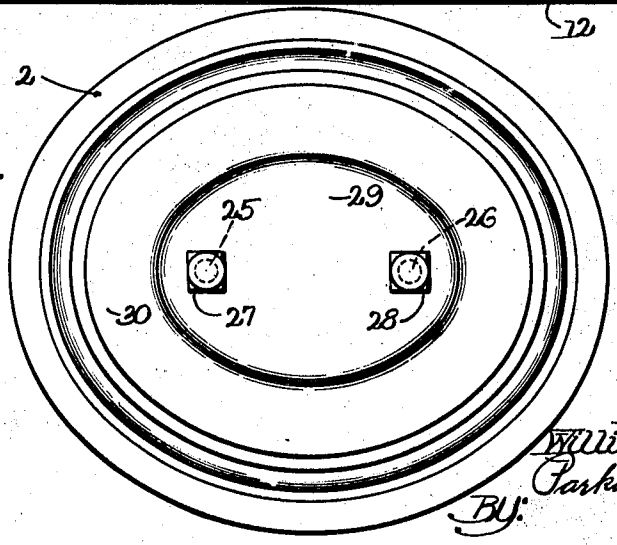


Fig. 2.

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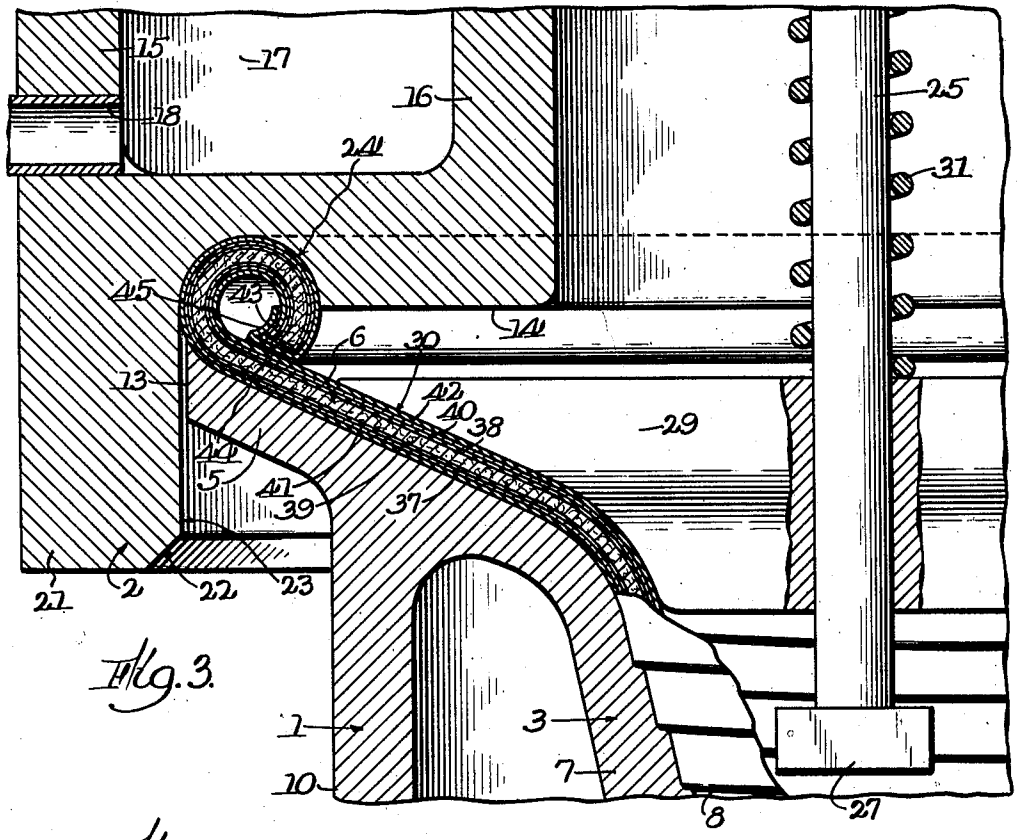


Fig. 3.

Fig. 4.

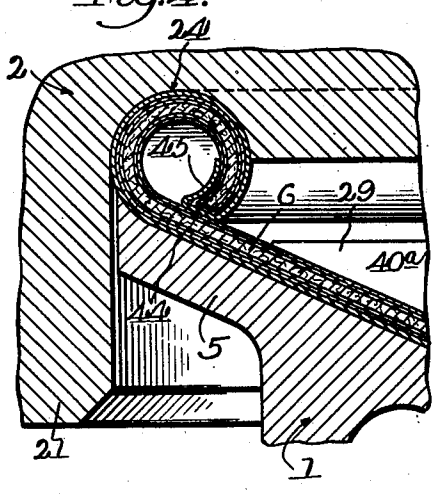
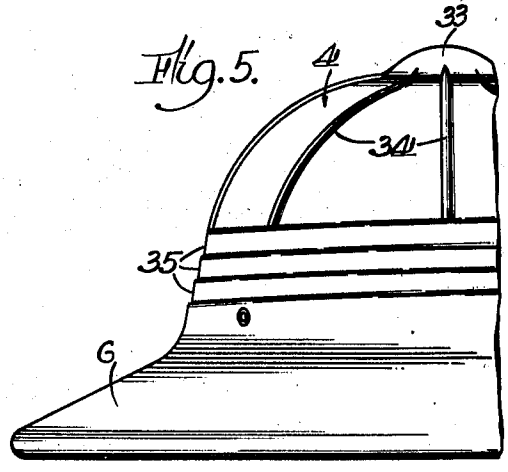


Fig. 5.



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UNITED STATES PATENT OFFICE

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FORMING DIE MEANS

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Application February 4, 1935, Serial No. 4,868

5 Claims. (Cl. 223—14)

The present invention relates to dies and more particularly to dies for forming or shaping articles.

Among the objects of the invention is to provide a novel die means so designed and constructed as to produce a given shape or form to articles being acted upon by the die means.

Another object is to provide a novel die designed to mold a thermoplastic substance with an article whereby the thermoplastic substance becomes a component part of the article.

When making fibrous articles of accreted fibres, the process is usually carried out by submerging a porous contoured molding or forming die in a bath of water and suspended fibres while at the same time causing a suction of the water through the apertures or pores of the molding die so as to accrete, interlace and integrate the fibres on the surface of the die to form a stratum of the fibrous material of the same contour as that of the contoured surface of the die. The wet blank, after emergence with the molding die from the bath, is then removed, dried, and suitably treated to effect the desired finished form. It may be compressed between dies to express the included water before drying, or between hot dies to dry and to give the blank the desired finish definition. It may also be treated with suitable material to give it the desired finish, as color, waterproofing properties, stiffness, toughness, insulating properties, etc.

For the purpose of illustrating the use of the present invention the article selected to illustrate such use, is a hat made in accordance with the above process, and more particularly disclosed in the co-pending applications of Jesse B. Hawley, and Edward C. Sloan et al., Serial No. 4,866 and Serial No. 4,862, both filed February 4, 1935, the latter application being assigned as is this application to Jesse B. Hawley of Geneva, Illinois.

The present invention, therefore, relates more particularly to a novel die for forming a bead at the edge of the brim of the hat or for curling said edge portion into a bead or the like.

Other objects, advantages, capabilities, features, and the like are comprehended by the invention as will later appear and as are inherently possessed by the invention.

Referring to the drawings;

Fig. 1 is a vertical sectional view through a die or die means constructed in accordance with the invention;

Fig. 2 is a bottom plan view of part of the die or die means, taken in planes represented by line 2—2 in Fig. 1 of the drawings;

Fig. 3 is an enlarged fragmentary sectional view of the die and an article acted on thereby at the final stage of operation;

Fig. 4 is a similar view showing the operation in connection with an alternate form of hat brim; and,

Fig. 5 is a fragmentary elevational view of a finished hat.

Referring more in detail to the drawings, the embodiment selected to illustrate the invention is shown as comprising die parts or components 1 and 2. The part 1 comprises a wall 3 contoured to correspond to the outer surface of the hat 4, this wall having a part 5 for supporting the brim 6 of the hat, and a part 7 for supporting the crown 8 of the hat. The lower portion of the wall 3 may be open for the projection of the crown top 9 as shown in Fig. 1. The wall 3 is preferably formed integrally with a supporting base 10, which may be cylindrical or oval and which is provided with a base flange 11 adapted to rest upon a table or platen 12. The upper outer edge 13 is designed to be no greater in diameter than the outer diameter of the hat brim.

The die part 2 comprises an annular plate 14 provided with a die surface and having upstanding spaced walls 15 and 16 forming therebetween a channel 17 with which communicate pipes or ducts 18 and 19 for delivery and discharge of heat transfer media or fluids. The upper edges of the walls 15 and 16 seat against a cover plate 20 suitably secured to the walls 15 and 16 in fluid tight contact.

Depending from the plate 14 is a rim 21 having a chamfered part 22 which serves to guide the rim 21 over the edge portion of the hat. The rim has an inner smooth guide surface 23 disposed perpendicularly with respect to the die surface of plate 14, and tangentially arranged with respect to, and merging into the outer edge of a bead forming or curling groove 24 provided in the die surface of plate 14 adjacent the rim 21, as clearly shown.

To the cover plate 20 are threadedly secured posts 25 and 26 having heads 27 and 28 on which is normally supported a presser plate 29 having a contoured surface 30 to conform with the inner surface of the brim 6 of the hat when the die part 2 is lowered for the presser plate to press on the brim of the hat to hold the hat in place when being acted upon. It will be observed that the peripheral edge of the presser plate 29 is spaced inwardly from the inner wall of the guide rim 21 a sufficient distance to provide clearance for the bead-forming functions on the hat rim.

On the posts 25 and 26 are springs 31 and 32 which react between the plates 20 and 29 as is clear from the drawings.

The hat is made as above mentioned and comprises a crown 8 formed with a boss 33 in representation of a top knot, ribs 34 in representation of seams, and ridges or the like 35 in representation of folds or pleats. The crown at its base flares into a brim 6 which has an edge portion 36 which is shaped by the die of this invention to form a bead.

The hat blank is produced by the accreting, interlacing and integrating of fibrous material as referred to above. After compressing and drying the hat blank the surface of the blank is coated inside and outside with coatings 37 and 38 of any suitable material, such as nitrocellulose, latex, rubber cement and the like. These coatings form sealing coverings or skins for hermetically sealing and enclosing the interstitial spaces or cells in the mass of the fibrous material so as to effect heat insulating properties, and to increase the proofing characteristics of the material. Then coatings 39 and 40 of a thermoplastic substance, preferably of a vinyl resin base or the like are applied to the outer and inner surfaces of the hat blank. This substance serves as an adhesive and as a binder for suitable coverings such as cloth coverings which may be applied to either or both the inner and outer surfaces of the hat blank. If desired the cloth coverings may be also coated with the thermoplastic substance. The application of heat by the use of hot contoured dies will fuse the thermoplastic material which will permeate the coverings and on cooling will set to firmly bind the coverings and also make the coverings waterproof and the like, the coverings being easily cleaned with the usual cleaning agents without affecting the coverings.

The thermoplastic substance referred to is in the class of synthetic resinous compounds known as the vinyl resins of the polymerization group and more particularly those which are permanently thermoplastic; characterized by the bond group or radical —CH:CH_2, and which are insoluble in most all known solvents, particularly the hydrocarbon solvents, except the solvents of the ester type or the higher ketones, such as hexone and butyrone. In other words, the substance used in this invention is chemically inert to the extent indicated above and hence is impervious to and proof against moisture, water, acids, alkalies, alcohols, oils, greases, fats and the like. In its normally pure state it is odorless, tasteless, colorless, and transparent. It is also non-inflammable. It may be given any color or made translucent or opaque as desired by the incorporating or mixing therewith of dyes, pigments, fillers, or the like. It is also tough, durable and resilient. It also has a very strong bonding or adhesive property. It may be applied either in liquid or solid form or both. When using this substance in liquid form, acetone preferably is used as the solvent but it is to be understood other solvents as mentioned above may be used without affecting the idea of invention herein disclosed.

In the present invention the thermoplastic substance is preferably applied to the surface of the coated hat blank by spraying in liquid form although it might be applied with a brush. As the volatile solvent evaporates the liquid thickens and even becomes tacky. Air drying may be used but if desired the coating may be dried more quickly in heated air or the like. When the spraying method is used, it is preferable to use some of the higher volatiles mentioned above so that the evaporating of the volatile solvent may be slower. It is preferable to air dry first to obtain a removal of the major portion of the volatile solvents, and then force dry, in heated air, to remove the residual volatiles.

As indicated above, the die is applied with pressure. It is heated to the necessary temperature to fuse and melt the thermoplastic substance so that it will be sufficiently plastic or fluidal to be easily displaced and to flow under the influence of heat and pressure of the die. The die is then either removed or cooled or permitted to cool so that the thermoplastic substance will congeal or solidify and set. This substance acts as a stiffener or reinforcer for the body of the hat, also as a protecting and preserving means preventing the access of moisture and other deteriorating media, etc. to the material of the hat, and also in some cases as an adorning or embellishing means to give the hat an appearance of elegance and the like.

In Fig. 3 are shown cloth coverings 41 and 42 which have been applied to the outer and inner coated surfaces respectively and made to adhere thereto by the thermoplastic substance. The edge portion 36 of the hat blank has previously been trimmed to leave the part 36 as shown in Fig. 1. After the thermoplastic substance and the cloth coverings have been applied the inner covering is trimmed even with the edge of the part 36 to provide the edge portion 43 thereof, and the outer covering is trimmed with an extension beyond the edge of the part 36 to provide portions 44 and 45 thereof. An excess of thermoplastic material is preferably applied to the edge of the part 36 as also to the trimmed edge portions of the cloth coverings, and then the trimmed extension 44—45 of the outer cloth covering is folded or bent over the edge of the part 36 and over the edge portion 43 of the inner covering as clearly shown in Fig. 1, the thermoplastic substance firmly holding the parts together by reason of the high degree of adhesiveness of the thermoplastic substance.

In Fig. 4, the inner cloth covering is omitted and the inner coating 40^a of thermoplastic substance of given or desired color or like character serves as the inner decoration of the hat, otherwise the outer cloth covering 41 is trimmed and folded or bent over in the same way as described above in connection with the structure shown in Fig. 3 of the drawings.

To form the bead or to curl the rim portion 36 (Fig. 1) the upper die component 2 is lowered, the inner smooth guiding surface 23 of which slides over and along the outer surface of the rim part 36 (Fig. 1). At the same time, the pressure plate 29 contacts the brim part 6 of the hat at the surface 30 of the plate, the springs 31 and 32 being compressed to apply the required pressure (Fig. 3). As the presser plate moves to the last mentioned position, the edge of the hat brim projects perpendicularly into the space between the periphery of the presser plate and the inner surface of the guide rim of the die member.

As the die part 2 is further lowered the upper edge of the rim part 36 is guided into the groove 24 at the outer side thereof and the edge portion of the rim is forced to follow the curvature of the groove so as to be curved or curled inwardly as it is caused to move along the curved surface of the groove so as to bring the end of the curl or the edge of the curled part into engagement with

the inner face of the brim as is clearly shown in Figs. 3 and 4 of the drawings. These functions all take place without interference by the presser plate. The groove 24 is shown as having a curvature of approximately 180°, but need not be a true arc in cross section and may be of slightly less or slightly greater extent without departing from the spirit of the invention. Therefore, the term "approximately 180°" as used in the specification and claims, is not intended to limit the invention to this precise measurement, but to define a groove which may be a true arc or more or less oval in cross section, and of sufficient surface, whether slightly more or slightly less than 180°, to perform the desired curling functions. Steam or other heat transfer medium is passed through the chamber 17 of the die part 2 as the latter is held in place to hold the curled part or bead in the form shown in Figs. 3 and 4. The heat is transmitted through the bead body so as to fuse the thermoplastic substance whereby it will permeate the coverings of the bead, especially the portion 44 contacting the brim 6. Then cooling water or other heat exchange medium is passed through the chamber 17 to cool the die part 2. This causes the thermoplastic substance to set and harden or congeal so as to rigidly and firmly hold the bead in its curled form and to firmly bind or unite the edge portion 44 of the bead to the adjacent portion of the brim. The die part 2 is then raised and the hat removed from the die part 1. Fig. 5 shows such a hat with the bead at its lower edge.

While I have herein disclosed an illustrative embodiment of the invention, it is to be understood that the invention is not limited thereto but comprehends other constructions, arrangements of parts, details, features, and the like without departing from the spirit of the invention.

Having thus disclosed the invention, I claim:

1. Die means for forming a bead at the edge of a hat brim comprising a die member provided with a die surface having a groove therein, said groove having a cross sectional curvature of approximately 180°, said die member having a guide rim encircling said groove, said guide rim having a guiding wall which is arranged perpendicularly with respect to said surface and merging into the outer edge of said groove, means for supporting a hat in such position that the free edge of the brim is projected toward said groove and in a position parallel with the inner wall of said guide rim, means for moving the die toward and from the supporting means in a line parallel with the inner wall of said guide rim, and a presser plate having its peripheral edge spaced from the said inner wall of the guide rim, the shape of the groove being such as to cause the free edge of said brim to travel into contact with the wall of the groove during movement of the die toward said support, said groove being so shaped as to curl said edge backwardly and inwardly toward the main portion of the brim.

2. Die means for forming a bead at the edge of a hat brim comprising a die member provided with a die surface having a groove in one face thereof, said groove having a cross sectional curvature of approximately 180°, said die member having a guide rim encircling said groove and having an inner guiding surface which is arranged perpendicularly with respect to the first mentioned surface, means for supporting a hat in such a position that the free edge of the brim is projected toward said groove and in a position parallel with said guiding surface, means for moving the die toward and from the supporting means in a line parallel with said guiding surface, and a presser plate having its peripheral edge spaced from said guide rim, said guiding surface being arranged tangentially with respect to the outer portion of said groove and merging thereinto in such manner as to direct the edge of the brim into contact with the wall of the groove during movement of the die toward said support, said groove being so shaped as to curl said edge backwardly and inwardly toward the main portion of the brim.

3. Die means for forming a bead at the edge of a hat brim comprising a die member having a chamber for containing a heat transfer medium, said chamber having a wall provided with a die surface having a groove therein, said groove having a cross sectional curvature of approximately 180°, said die member having a guide rim encircling said groove, said guide rim having a guiding wall which is arranged perpendicularly with respect to said surface and merging into the outer edge of said groove, means for supporting a hat in such position that the free edge of the brim is projected toward said groove and in a position parallel with the inner wall of said guide rim, means for moving the die toward and from the supporting means in a line parallel with the inner wall of said guide rim, and a presser plate having its peripheral edge spaced from the said inner wall of the guide rim, the shape of the groove being such as to cause the free edge of said brim to travel into contact with the wall of the groove during movement of the die toward said support, said groove being so shaped as to curl said edge backwardly and inwardly toward the main portion of the brim.

4. Die means for forming a bead at the edge of a hat brim comprising a supporting die, a presser die, said last mentioned die being provided with a die surface having a groove therein, said groove having a cross sectional curvature of approximately 180°, said pressing die also having a guide rim encircling said groove and having a guiding wall which is arranged perpendicularly with respect to said die surface and merging into the outer edge of said groove, means for supporting a hat in such position that the free edge of the brim is projected toward said groove and in a position parallel with the guiding surface, means for moving the pressing die toward and from the supporting die in a line parallel with the guiding surface of said guide rim, and a presser plate carried by said pressing die and having means for holding the hat in position on the supporting die during the formation of the bead, said presser plate having its peripheral edge spaced from the said inner wall of the guide rim, the shape of the groove being such as to cause the free edge of said brim to travel into contact with the wall of the groove during movement of the die toward said support, said groove being so shaped as to curl said edge backwardly and inwardly toward the main portion of the brim.

5. Die means for forming a bead at the edge of a hat brim comprising a die member provided with a chamber for containing a heat transfer medium, said chamber having a wall provided with a die surface having a groove therein, said groove having a cross sectional curvature of approximately 180°, said die member having a guide rim encircling said groove and provided with a guiding surface which is arranged perpendicularly with respect to said die surface and merging into the outer edge of said groove, a supporting

die for the hat so constructed and arranged as to support the hat in such position that the free edge of the brim is projected toward said groove and in a position parallel with said guiding surface, means for moving the die toward and from the supporting means in a line parallel with said guiding surface, a presser plate yieldably supported by said die member, the area of said presser plate being such that while engaged with the hat its peripheral edge is spaced from said guiding surface, said guiding surface being arranged tangentially with respect to the outer portion of said groove and merging thereinto in such manner as to direct the free edge of said brim into contact with the wall of said groove during movement of the die toward said support, said groove being so shaped as to curl said edge backwardly and inwardly toward the main portion of the brim.

WILLIAM C. GRAY.