Feb. 17, 1959 M. J. CELOVSKY 2,873,709

COATED DIE STRUCTURE AND METHOD

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Fig. 1

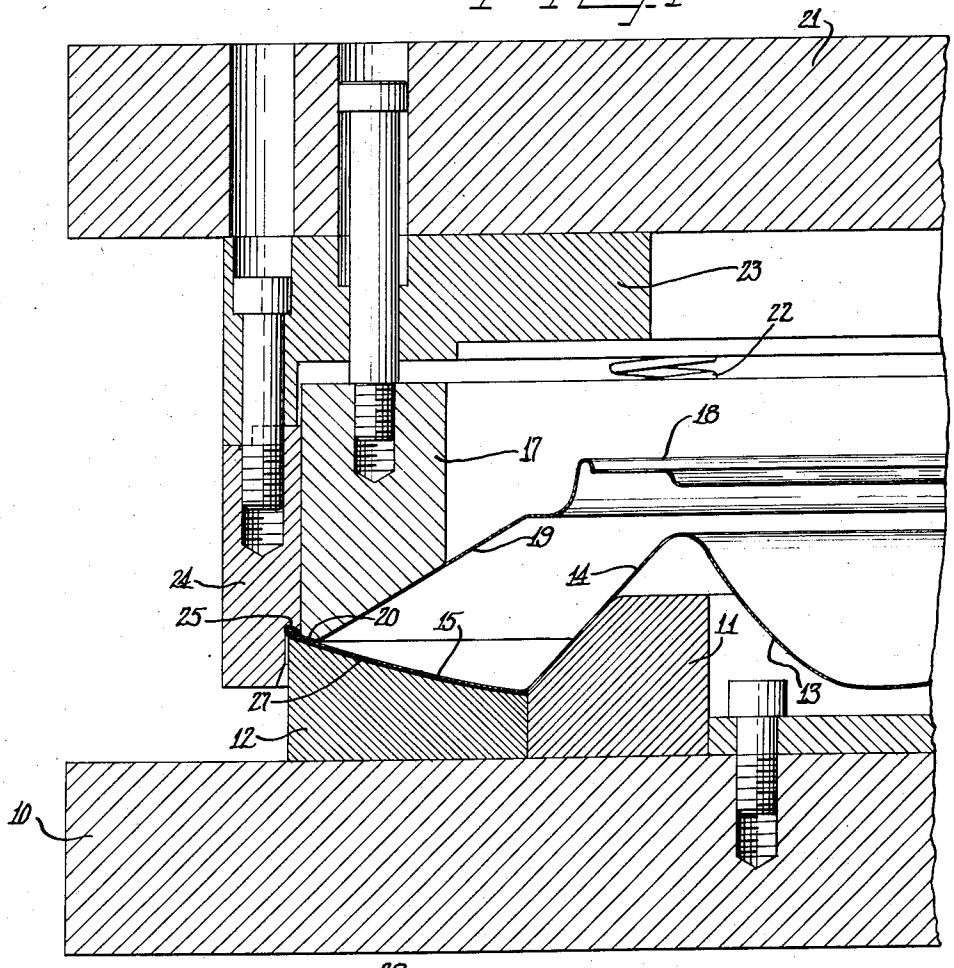
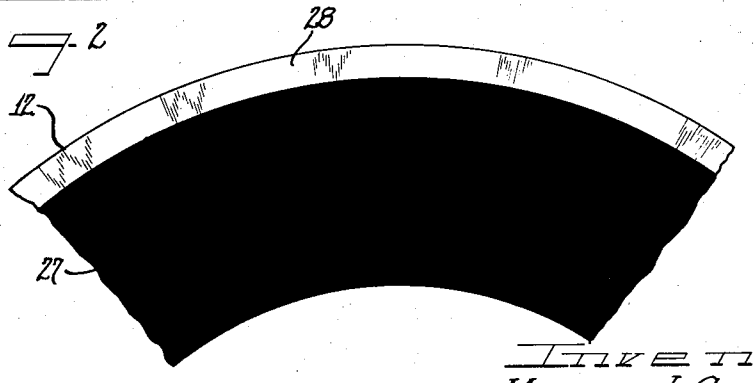


Fig. 2



Inventor
MICHAEL J. CELOVSKY

Hill, Sherman, Meroni, Gross & Simpson
Attys

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Fig. 3

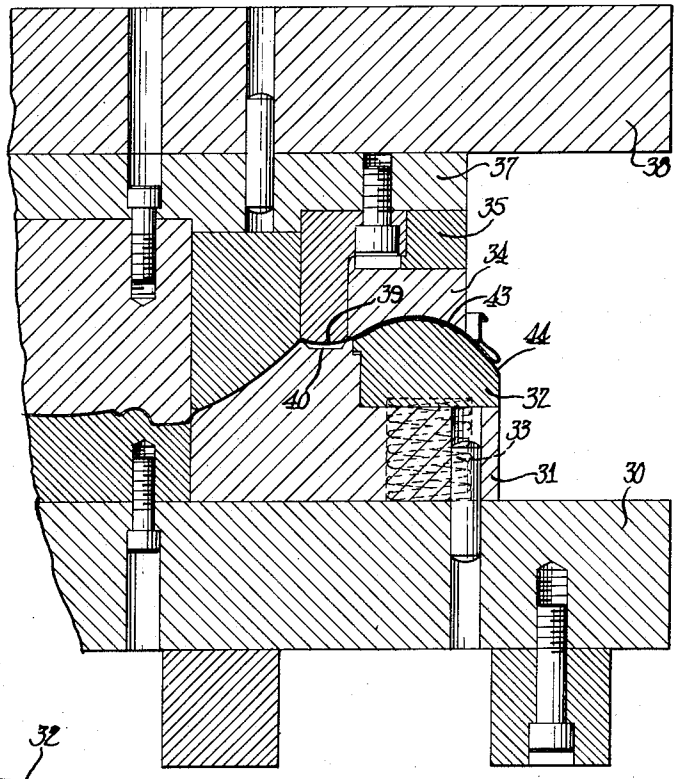


Fig. 4

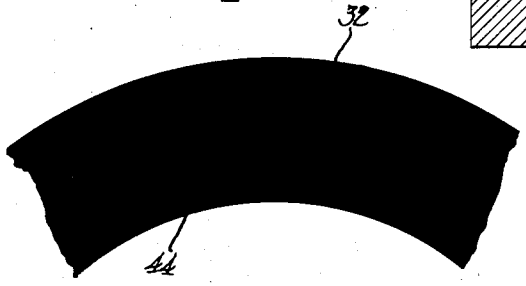
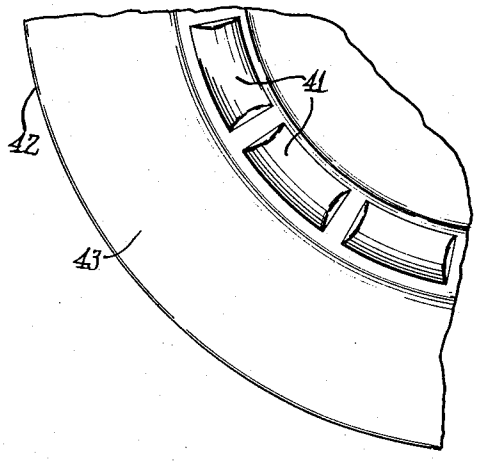


Fig. 5



Inventor
MICHAEL J. CELOVSKY

by Hill, Sherman, Meroni, Gross & Simpson Attys

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2,873,709

COATED DIE STRUCTURE AND METHOD

Michael J. Celovsky, Detroit, Mich., assignor to Lyon, Incorporated, Detroit, Mich., a corporation of Delaware

Application June 24, 1953, Serial No. 363,856

2 Claims. (Cl. 113—49)

The present invention relates to improvements in sheet metal drawing or forming die techniques, and more particularly relates to the provision of a die member against which highly polished sheet metal surfaces can be pressed without damage to the finish of the sheet metal article.

An important object of the present invention relates to the treatment of shaping or forming die surfaces for sheet metal work to enable highly polished sheet metal surfaces to be pressed under substantial pressure against the die surfaces without abrading or otherwise damaging the polished surfaces.

A further object of the invention is to provide an improved coated die structure.

Still another object of the invention is to provide a sheet metal die structure having the surface thereof treated to provide a thin cushioning layer thereon which will withstand high pressures in service without damage.

Yet another object of the invention is to provide a novel coating for the pressure surfaces of sheet metal dies.

Other objects, features and advantages of the present invention will be readily apparent from the following detailed description of certain preferred embodiments thereof, taken in conjunction with the accompanying drawings in which:

Figure 1 is a more or less schematic vertical sectional detail view of a portion of a sheet metal working die of a kind particularly adapted for making wheel covers, and embodying features of the present invention;

Figure 2 is a fragmentary top plan view of a coated die member of the assembly shown in Figure 1;

Figure 3 is a fragmentary more or less schematic vertical sectional view through a modified form of sheet metal working die assembly embodying features of the invention;

Figure 4 is a fragmentary top plan view of a coated die member of the assembly of Figure 3; and

Figure 5 is a fragmentary side elevational view of a wheel cover after it has been formed in the die assembly of Figure 3.

In the manufacture of sheet metal articles such as wheels covers, that is covers adapted to be applied to the outer sides of vehicle wheels such as automobiles, certain forming operations must be performed after at least certain external surface areas of the cover have been highly polished. As an incident to the forming operations, the highly polished surface areas are necessarily forced with substantial pressure against a die surface and are therefore liable to abrasion or pressure damage of the polished areas.

According to the present invention, the surfaces of the die elements which must engage under pressure with highly polished surface areas of sheet metal articles such as wheel covers in the process of formation of the articles are coated with a highly pressure resistant, chip-proof thin cushioning coating of an enamel, and more particularly a synthetic enamel. Excellent results have been obtained in practice with an enamel in which the

body ingredient is a phthalic alkyd resin. In a preferred formula, the enamel comprises pigment approximately 20.8%, synthetic resin 30.2%, solvents 49% and comprising aliphatic hydrocarbon 18.1% and aromatic hydrocarbon 30.9%. For ready identification of the surface the pigment is preferably a bright color such as chrome yellow.

In treating a die surface with the enamel, the die surface is first cleaned in hot caustic solution and is thereafter bonderized, that is, treating the surface with a solution of primary manganese di-hydrogen phosphate and a small percentage of a copper salt by dipping or spraying on the solution. Thereafter, the enamel is sprayed onto the die surface to be treated in a double wet coat. The coated surface is then baked at 280° to 290° F. for about one hour. No driers are used in the enamel. The alkyd resin is preferably in a pure, unmodified form. The resulting coating is highly resistant to pressures, is satisfactorily resilient and is chip-proof. It is thus long wearing so that a die can be used a large number of times without requiring recoating.

As an example of a die structure in which the present invention has found a high degree of utility, reference is made to Figures 1 and 2. A die base **10** has thereon circular ring dies comprising an inner die member **11** and an outer die member **12** which are provided with working surfaces properly profiled to match and thereby receive uniformly thereagainst the outer surfaces of a wheel cover plate **13** made from sheet metal and having the outer surfaces thereof highly polished as to a substantially mirror finish. In the present instance, the inner die ring **11** serves primarily as a centering die to receive a more or less frusto-conical intermediate portion **14** of the cover plate **13**, while the outer die member **12** provides a bearing surface to receive uniformly thereagainst an outer marginal portion **15** of the cover plate and to support such outer marginal portion against deformation while a hold down ring die member **17** presses an outer marginal portion of a second cover plate member **18** against the back face of the cover plate portion **15**. As will be observed, the cover plate **18** has a portion **19** thereof directed convergently to the outer extremity portion of the cover margin **15** where a marginal extremity flange **20** of the cover portion **19** is driven hard against the opposing marginal extremity area of the cover portion **15**.

The upper hold down die ring **17** is supported yieldably by a die head **21**, with springs **22** normally urging the hold down die ring **17** into substantial spaced relation to a backing plate member **23** carried by the die head **21**.

Upon downward movement of the die head **21** to drive the hold down ring **17** against the marginal portion **20**, a crimping die ring **24** carried by the outer perimeter of the backing plate **23** operates to turn an extremity flange **25** of the marginal portion **15** over into crimped retaining relation to the plate margin **20** for thereby uniting the cover plates **14** and **18**. Pressure of the hold down member **17** is reflected in substantial pressure of the cover marginal portion **15** against the opposing bearing surface of the die member **12**. Accordingly, the bearing surface of the die member **12** is provided with a cushioning coating **27** of the protective coating enamel as described hereinabove. This affords protection against damage of the highly polished external surface of the cover marginal portion **15**.

Inasmuch as direct pressure from the hold down member **17** is exerted on a narrow annular marginal extremity portion of the cover portion **15**, it has been found desirable to omit the cushion coating **27** from the annular outer extremity marginal area of the bearing surface of the die ring **12**, as indicated at **28**. The

concentration of pressure in this narrow area is so great that the life of the enamel coating would be too short to be practicable in this narrow area as compared to the remainder of the bearing area. Moreover, the narrow area **28** is preferably highly polished complementary to the highly polished surface of the opposing cover surface so that danger of damage of the highly polished surface is substantially eliminated.

In the modified die assembly of Figures 3 and 4, a cover of different type is shaped. In this die assembly, a base plate **30** supports a ring die member **31** carrying a clamping ring die member **32** which is normally elevated relative to the die member **31** through the medium of springs **33**.

Opposing the clamping ring **32** is a hold down ring die member **34** attached to a forming die ring **35** carried by a backing plate **37** supported by a die head **38**. The die ring **35** has forming surfaces **39** cooperative with recesses **40** in the underlying die ring member **31** inside of the clamping die ring **32** for producing embossments **41** in a cover member **42** which has a marginal annular portion **43** of dished cross-section clamped between the clamping ring **32** and the hold down die member **34** during the forming or drawing action of the cooperative die members.

Since the outer dished surface of the cover portion **43** is highly polished and buffed to a mirror finish, it must be protected against pressure damage between the die members **32** and **34**. To this end, the cover surface opposing bearing surface of the clamping die member **32** is provided with a protective enamel coating **44**. This provides a cushion and protective resilient surface between the bearing face of the die member **32** and the highly polished surface of the cover portion **43**. It will be observed that inasmuch as the pressure against the cover portion **43** is substantially uniformly applied over the entire surface engaging the clamping die member **32**, the entire bearing surface is coated with the coating **44**.

It will be understood that modifications and variations may be effected without departing from the scope of the novel concepts of the present invention.

I claim as my invention:

1. In a die structure, a circular die member having an annular surface receptive of a highly polished complementary surface of a sheet metal member and against which annular die surface the sheet metal member must be pressed with substantial pressure for holding the sheet metal member immovable while forming operation is effected upon the sheet metal member by yet other die means, said annular surface having thereon, except for a narrow annular marginal portion thereof, and thoroughly bonded thereto a highly pressure resistant but satisfactorily resilient and chip-proof layer of a substantially pure unmodified alkyd resin enamel free from driers and fused by baking, and effective as a cushion to prevent abrasion or pressure damage of the polished sheet metal article surface pressed thereagainst, said narrow marginal portion being highly polished for receiving thereagainst a corresponding narrow annular portion of the surface of the sheet metal member against which forming pressure is applied in excess of the pressure applied against that portion of the sheet metal surface opposed by the baked enamel cushion.

2. In a process for die shaping sheet metal articles having polished surfaces susceptible of marring when subjected to forming pressure between opposing dies and which polished surfaces must be protected against marring while being subjected to the forming pressures between the dies, the method of preparing a die member for supporting against a substantial surface area thereof an opposing highly polished surface of a sheet metal member under substantial pressure of the opposing die directed toward said die member surface area, cleaning said surface area of the die member, treating said cleaned surface area to enhance the adhesion thereto of an enamel coating, applying to said die surface area in fluid form an enamel composition free from driers and consisting essentially of a substantially pure unmodified phthalic alkyd resin as the major solids component, and solvents, and baking the coating for a time interval and at a temperature sufficient completely to fuse the enamel coating and provide a highly compression pressure resistant and chip-proof resilient cushion upon said die surface area, serving as a protection against marring of the polished sheet metal surface pressed thereagainst and then pressing the polished surface of said metal member against the resilient cushion protected surface area of said die member.

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