A. J. FISHER.

MACHINE ELEMENT AND METHOD AND APPARATUS FOR MAKING SAME.

APPLICATION FILED OCT. 18, 1918.

1,365,029. Patented Jan. 11, 1921.

Fig. 1.

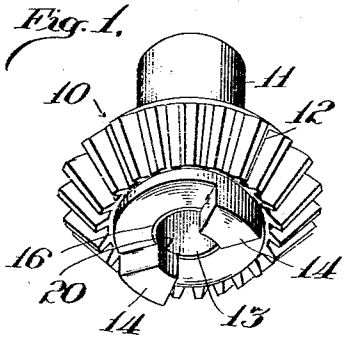


Fig. 5.

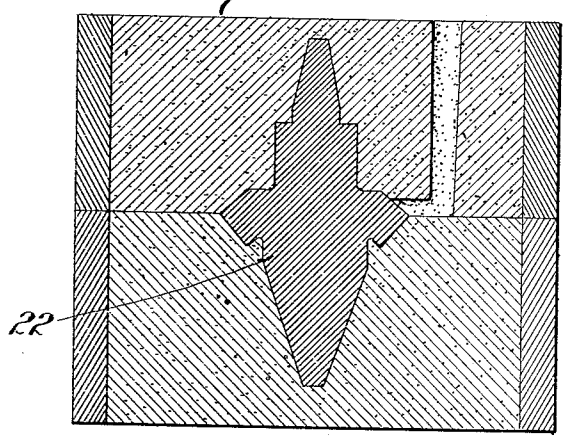


Fig. 2.

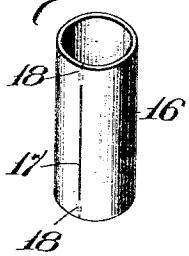


Fig. 3.

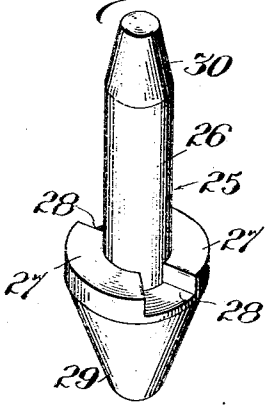


Fig. 6.

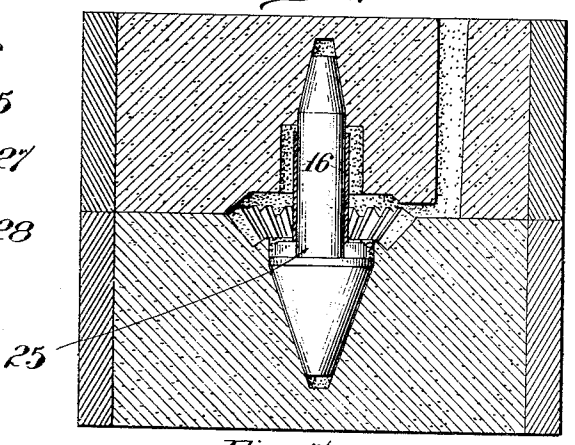


Fig. 4.

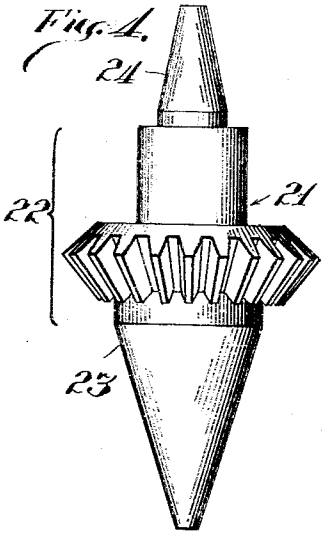
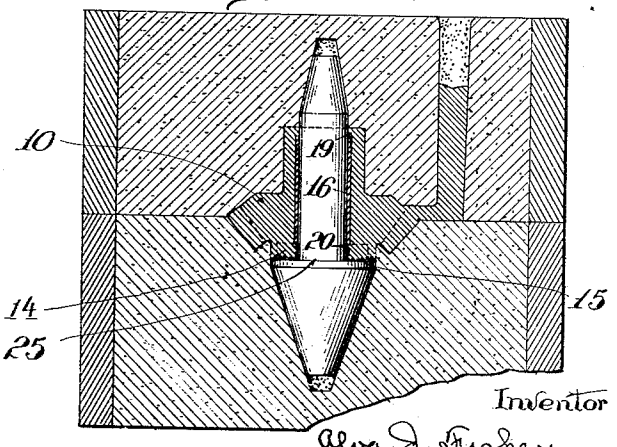


Fig. 7.



Inventor

Alva J. Fisher

By Victor Hibben Davis & Macauley

Attorneys.

UNITED STATES PATENT OFFICE.

ALVA J. FISHER, OF EVANSTON, ILLINOIS, ASSIGNOR TO HURLEY MACHINE COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

MACHINE ELEMENT AND METHOD AND APPARATUS FOR MAKING SAME.

1,365,029. Specification of Letters Patent. Patented Jan. 11, 1921.

Application filed October 18, 1918. Serial No. 258,718.

To all whom it may concern:

Be it known that I, ALVA J. FISHER, a citizen of the United States, residing at Evanston, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Machine Elements and Methods and Apparatus for Making the Same, of which the following is a specification.

My invention relates to a machine element and method and apparatus for making the same.

Gears intended to be mounted on shafts, where accuracy of fit with the shaft is important, are usually machine made, but it is desirable, for economy to cast such gears if possible, and in many classes of mechanisms cast gears will perform satisfactorily in lieu of machine-cut gears. One of the objects of my invention is to provide a cast gear that will accurately fit, and secure proper bearing upon its receptive shaft, with its shaft apertured initially so that no tooling or drilling of the shaft hole is necessary to condition the gear for use.

Furthermore in many situations, a gear element may beneficially be supplemented with working surfaces at its end, such as clutch parts—either projections or indentations, the surfaces of which should be hard, and an object of my invention is to provide a unitary gear-and-clutch element having hardened clutch surfaces.

A further object of my invention is to afford a simple and effective method of casting such gears or unitary gear-and-clutch elements or kindred articles of manufacture, insuring the existence in the product of the characteristics above referred to and also to provide apparatus for the simple and efficient production of the gears by such method.

To these ends, and others that will become apparent to those skilled in the art, from the following description, my invention consists in the novel features of structure and method hereinafter more fully described, and claimed.

In the drawing Figure 1 is a perspective view showing the unitary gear-and-clutch element; Fig. 2 is a detail of a sleeve; Fig. 3 is a detail of a chill block and core; Fig. 4 is an elevation of a pattern; Fig. 5 shows a mold with pattern embedded therein; Fig. 6 shows the mold with the pattern removed and replaced by the chill block, carrying a sleeve; and Fig. 7 shows, sectionally, completion of the casting operation.

The specific gear 10, shown in Fig. 1, is of a construction that I use in washing machine gearing, and is of the beveled type, provided with crown clutch projections; but it will be understood that in the broader aspects of my invention I do not limit myself in these matters of detail, as my invention may be practised in the production of many forms of gear elements and clutch elements and other machine parts intended to interfit with shafts and of character suitably produced by casting operations.

In the particular article shown the hub 11 and beveled gear teeth 12 that constitute, in the specific structure shown, the peripheral or radial working surfaces of the element may, for many uses, ordinarily be of the relatively soft quality of sand-cast metal, and in many instances they have unfinished surfaces, although for finer work more or less surface machining may be desirable and obviously employed if necessary, with some consequent increase in expense. It is, however, usually important that the shaft hole 13 be accurately sized and centered, and difficulty in meeting this requirement is an important objection to the casting of gears and other shaft-fitting articles with preformed shaft holes. Clutch elements, such as the lugs 14, may best be of harder material than sand-cast iron or steel, but in many instances must be unitary with the gear element. I preferably fulfil both requirements by chilling the clutch surfaces in such a unitary gear clutch element, as diagrammatically suggested by the shading at 15, Fig. 7.

To meet the important requirement of shaft hole sizing, I mold axially in the gear or kindred element a sleeve 16 of the appropriate internal diameter, such sleeve, as indicated in Fig. 2, being preferably a true cylinder pre-formed of relatively thin metal, drawn or rolled. In practice I have found that satisfactory and economical use may be made of sleeves formed up of sheet steel into a seamed tube, the seam 17 being closed by welding 18 only at the ends of the cylinder. These sleeves I am able to make very accurate in size, and of true cylindrical

contour, with minimum expense. The cylinder is preferably slightly shorter than the full length of the shaft hole so that, in the casting operation, the cast metal may overlie the cylinder inner ends, at certain spots, or throughout the circumference of the sleeve, as the mold configuration may provide. Thus in the particular construction shown the sleeve may be completely overlain by the cast metal lip 19, as shown in Fig. 7 at its upper end, and at its lower end it is overlain at spots 20 by lips of the clutch projections 14.

In the production of such an article of manufacture, wherein it is requisite that the sleeve shall accurately define the shaft hole diameter, and shall be centered very accurately with respect to the gear-periphery or gear-toothed portion of the element, I employ the apparatus and method of production that I will now describe.

The pattern 21, shown in Fig. 4, is suitably shaped in its central zone 22 to give the desired form to the gear teeth and hub. It is, however, supplemented by axially tapering projections 23 and 24 to form guide cavities in the sand. Such a pattern, placed in the sand as shown in Fig. 5, produces a cavity that gives suitable guide extensions axially beyond the central zone. The diagrammatic illustration and common knowledge of the casting art are suitable to give adequate information as to convenient construction and parting of the flask, etc., without specific description. The corepiece 25, Fig. 3, having a stem 26 neatly interfitting with and supporting the sleeve 16 and preferably to project slightly above the upper end thereof, and having a lower chill block 27 recessed as at 28 to give shape to the clutch projections 14 of the casting, and having axial guide extensions 29 and 30 identically corresponding to portions (or whole) of the pattern portions 23 and 24, is fitted in the flask as shown in Fig. 6, with the sleeve in place thereon. It will be observed that the guidance of the parts 29 and 30 in identically shaped portions of the mold cavity insures absolute precision in the centering and alinement and axial positioning of the sleeve with respect to the mold cavity.

When the mold cavity is metal-filled, as shown in Fig. 7, the casting obviously takes the requisite form (due shrinkage allowance in the tooth dimensions being made in accordance with known skilful practice). The chill block is effective in chilling the surfaces with which it contacts to harden the active surfaces 15 of the clutch projections 14, as heretofore referred to. The sleeve plays an important part in the matter. When it is invested with the molten metal its thinness enables it to expand rapidly, and then to shrink sufficiently with the cooling metal to resume substantially its original diameter, its cylinder-form making it strongly resist over-compression or reduction to a diameter less than its initial size. The sleeve gives the inner surface of the completed element a uniform and desirable texture and finish, and, importantly, it insures easy removability of the article from the corepiece and without scoring or otherwise injuring the stem of the latter.

It will be apparent that the method and apparatus described are available in casting of parts other than the gear-and-clutch element described, and while I have herein set forth the details of one satisfactory practice and embodiment of my invention, it will be understood that I do not thereby limit myself to such details in the broader aspect of my invention but that many changes and adaptations may be made within the spirit of my invention and within the scope of the appended claims.

What I claim is:

1. As an article of manufacture, a machine element comprising a pre-formed, shaft-fitting sleeve and a metal body cast therearound having, integrally, soft cast portions forming peripheral working surfaces and harder, chilled working surfaces at its end.

2. As an article of manufacture, a gear element comprising a shaft-fitting sleeve pre-formed of appropriate diameter, and a cast metal gear toothed body co-axial with and intimately engaging the sleeve, said element having integrally at an end chilled working surfaces harder than the gear-teeth.

3. As an article of manufacture, a combined gear-and-clutch element having an axial shaft-fitting opening, peripheral teeth, and clutch surfaces; comprising a preformed sleeve affording the axial shaft-receptive opening of predetermined diameter and a metal body cast therearound affording soft cast teeth and chilled clutch surfaces.

4. As an article of manufacture, a combined beveled gear and crown clutch element comprising a pre-formed sleeve affording a shaft-fitting opening, a body cast therearound having peripheral teeth and chilled crown clutch surfaces, and portions of said cast material extending radially inward beyond the outer periphery of the sleeve to retain the same axially.

5. The method of making cast, shaft fitting machine elements which consists in supporting a pre-formed, shaft fitting sleeve upon a metal chill-block an integral portion of which enters the sleeve and a further portion of which constitutes a casting-shaping surface; inserting the sleeve and chill-block in a non-chilling mold affording a suitable cavity which will expose the shaping surface of the chill block, and casting the element

upon and about the sleeve and in contact, throughout part of its surface, with the chill block.

6. The method of casting shaft-fitting machine elements, which consists in preparing a molding cavity with opposed guide-extensions at its ends extraneous to the article-shaping surfaces of the cavity, supporting a thin, pre-formed, shaft-fitting sleeve snugly on a metallic core-piece that extends beyond the sleeve and is shaped adjacent its ends to fit the opposite guide extensions of the mold, placing said sleeve-carrying core-piece in the guiding cavity extensions and casting the machine element around the sleeve.

7. The method of making a combined gear-and-clutch element which consists in forming in molding material a cavity for shaping peripheral portions of the article and having axial guide extensions, setting in said cavity a corepiece having portions similar to and interfitting with the guide extensions of the cavity and affording also a chill block surface defining an end portion of the molding surface, providing a pre-formed sleeve encircling and interfitting with an axial portion of said corepiece, and casting said element around said sleeve.

ALVA J. FISHER.