United States Patent [19]

Schrader, Jr.

[11] **3,830,285**

[45] **Aug. 20, 1974**

[54] **ADJUSTABLE CASTING PATTERN**

[75] Inventor: **Carl N. Schrader, Jr.**, Newport, Mich.

[73] Assignee: **Rockwell International Corporation**, Pittsburgh, Pa.

[22] Filed: **Dec. 7, 1972**

[21] Appl. No.: **313,014**

[52] **U.S. Cl.** **164/249**

[51] **Int. Cl.** **B22c 7/00**

[58] **Field of Search** 164/235, 249, 368, 45, 164/369; 249/184, 186

[56] **References Cited**

UNITED STATES PATENTS

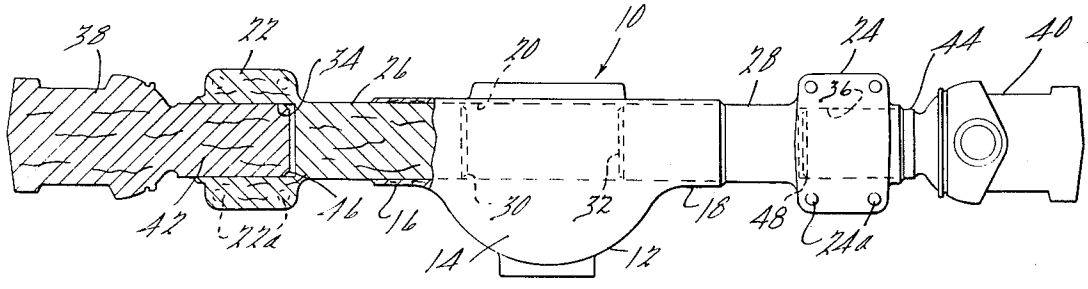
151,343	5/1874	Aston	164/249
696,035	3/1902	Gilson	164/45
963,086	7/1910	Sodemann	164/249
973,239	10/1910	Tidnam et al.	249/186
3,444,759	5/1969	Kueny	164/235 X

Primary Examiner—J. Spencer Overholser
Assistant Examiner—John E. Roethel

[57] **ABSTRACT**

A pattern for use in forming molds for the casting of a family of products. Each of the products has a central portion of fixed dimensions and a pair of satellite portions of fixed dimensions spaced from the central portion. The distances between the central portion and the satellite portions and thus the structure therebetween are variable within the family of products. The casting pattern comprises a main body corresponding to the central portion and a pair of secondary portions corresponding to the satellite portions with each of the secondary portions having an elongate projection extending therefrom. The main body has openings formed therein on opposite sides thereof and each projection is telescopically received in one of the openings and slidable therein for adjustment of the distance between the main body and each of the secondary positions.

3 Claims, 3 Drawing Figures



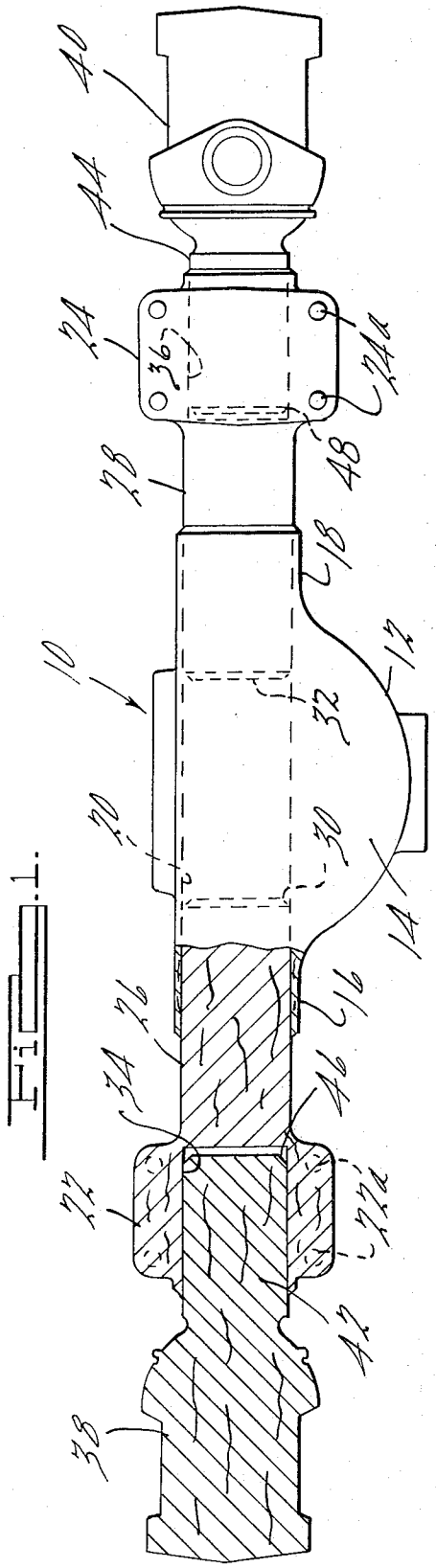


Fig. 1.

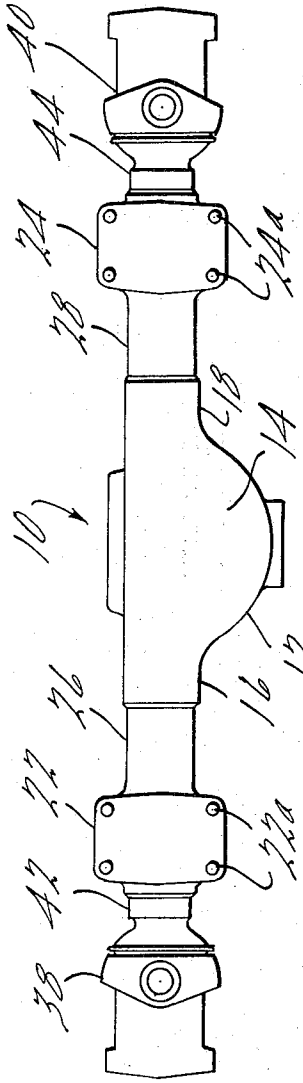


Fig. 2.

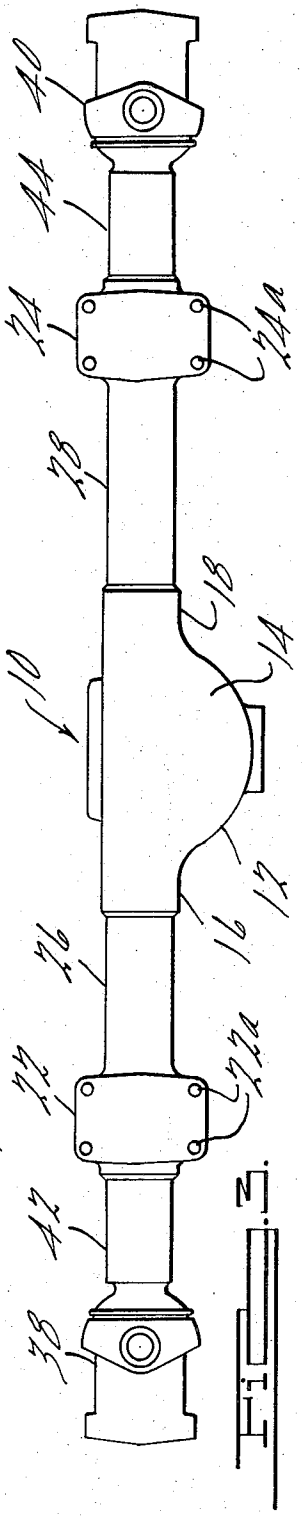


Fig. 3.

ADJUSTABLE CASTING PATTERN

BACKGROUND OF THE INVENTION

Conventional sand casting production entails preparation of a mold by packing sand around a pattern. When the pattern is removed, a cavity is left having the size and shape of the casting to be made which is then filled with molten metal. The pattern thus generally is the same size as the exterior dimensions of the finished casting although some allowance must be made for shrinkage of the molten metal upon cooling in the mold.

Such casting production techniques have widespread use in the production of housings for axles such as truck or off road equipment drive axles. Cast axle housings of this type include a central housing bowl formed to accommodate gearing in the finished axle, mounting bosses located on opposite sides of the bowl and end structure that may include a socket member in a steering axle housing. These cast axle housings may be categorized in "families" of similar housings in which the bowls, mounting bosses and end structures are identical but are separated by varying lengths of housing sections. Heretofore, it has been necessary to utilize a different casting pattern in the production of each member of such a housing family. Since patterns usually are formed from wood or plaster and require the hand labor efforts of highly skilled artisans, a considerable expense in the production of these axle housings is attributable directly to the need for a separate pattern for each and every housing having a unique dimension of any sort.

In the past, limited attempts have been made to provide casting patterns of changeable sizes that could be used in the production of various sizes of cast products. Such a prior art casting pattern is disclosed by U.S. Pat. No. 1,468,202, issued Sept. 18, 1923. Adjustable casting patterns such as that disclosed in this patent have not gained wide utilization and, in fact, are quite rare in the art because they have only the limited capability of being adjustable in length in a single direction from the fixed dimension main body of the pattern. Also, prior art adjustable casting patterns have included cumbersome adjusting features requiring the performance of complex, time-consuming manual tasks in order to accomplish a change in pattern size. Thus the concepts utilized in prior art adjustable casting patterns wholly are inapplicable to the manufacture of axle housings such as those described above which are quite complex in shape, require pattern size adjustment in two opposite directions and are produced in extremely high volume making mandatory the inclusion of only relatively high speed production techniques.

It is, therefore, an object of this invention to provide a casting pattern capable of being adjusted to change its dimensions quickly and easily.

A further object of this invention is to provide an adjustable casting pattern capable of being changed in size in at least two different dimensional directions from a constant configuration main portion.

A still further object of this invention is to provide an adjustable casting pattern capable of use in the preparation of molds for an entire family of drive axle housings.

SUMMARY OF THE INVENTION

An adjustable pattern constructed in accordance with the teachings of this invention is adapted for use in the forming of molds for casting a family of products. Each of the products has a central portion of fixed dimensions and a pair of satellite portions spaced from the central portions. The distances between the central portion and the satellite portions are variable within the family of products. The casting pattern comprises a main body corresponding to the central portion and a pair of secondary portions corresponding to the satellite portions. Movable connecting means join each of the secondary portions to the main body and are adjustable to vary the distance between the main body and the secondary portions.

DESCRIPTION OF THE DRAWINGS

FIG. **1** is a sectioned plan view of a pattern constructed in accordance with this invention;

FIG. **2** is a plan view of the pattern of FIG. **1** illustrating the pattern in a first dimensional configuration; and

FIG. **3** is a view similar to FIG. **2** but showing the pattern of this invention in a second dimensional configuration.

DESCRIPTION OF THE INVENTION

Referring now in detail to the drawings, the numeral **10** denotes generally an adjustable casting pattern constructed in accordance with this invention. The pattern **10** illustrated is utilized to form molds for the casting of all the members of a family of vehicle axle housings of the steerable, drive type. (It is to be understood, however, that by making slight modifications in external configuration, a pattern similar to pattern **10** could be formed for utilization in the production of different types of axle housings such as the non-steerable type.) The members of the family of axle housings that can be produced utilizing the pattern **10** include certain portions of identical size and configuration and other portions of varying size as will be described in detail below.

Since the external configuration of a casting pattern such as pattern **10** is nearly identical to the external configuration of the finished cast product, an axle housing, the terminology utilized herein to describe the parts of the pattern corresponds to terminology utilized in the art to describe various parts of the axle housings. Thus, the pattern **10** has a central bowl portion **12** having an enlarged midportion **14.** It readily may be understood that in the finished axle housings, portion **14** is hollow and accommodates gearing. On either side of portion **14,** the bowl **12** has portions of reduced size **16** and **18** that correspond to the axle housing portions through which pass half shafts driven by the gearing located within the portion **14.** The bowl **12** of pattern **10** is formed with a bore **20** extending therethrough that is concentric with the portions **16** and **18** of reduced diameter. It should be understood that while bore **20** is illustrated as singular and extending through the length of bowl **12,** it would be an equivalent to form bowl **12** with a pair of concentric but noncommunicating bores that open at the extremities of the portions **16** and **18.**

The reference numerals **22** and **24** denote the mounting boss portions of the pattern **10.** In the finished axle,

the mounting bosses are utilized to connect the axle to a vehicle suspension. Mounting bosses **22** and **24** thus are formed with irregular configurations **22***a* and **24***a* respectively to provide the required shape for attaching pads. Elongate portions **26** and **28** extend from one side of mounting bosses **22** and **24** respectively and are of such size that they are received within the bore **20.** The ends of projections **26** and **28** are reduced in size by the formation of chamfers **30** and **32** in order to facilitate the insertion of these projections within the bore **20.** Mounting bosses **22** and **24** have formed therein bores **34** and **36** respectively, that open on the sides of the mounting bosses remote from the projections **26** and **28.**

A pair of socket members **38** and **40** are located outboard of the mounting bosses **22** and **24** respectively. These socket members correspond to the axle part that would connect to a steering knuckle. A pattern similar to pattern **10** utilized in the production of non-steering drive axles would have more simple configurations in place of the socket members **38** and **40.** Elongate projections **42** and **44** extend from the socket portions **38** and **40** respectively, and are telescopically received in the bores **34** and **36** of the mounting bosses. The ends of projections **42** and **44** also are reduced in size by the formation of chamfers **46** and **48** respectively, in order to facilitate the assembly of the pattern.

In the family of cast axles produced utilizing pattern **10,** the dimensions of the bowl **12,** bosses **22** and **24** and socket members **38** and **40** are identical. The distances between these identical portions vary greatly, however, depending upon the vehicle for which the axle family member is intended for inclusion. Such variances in axle dimensions are accommodated by pattern **12** due to the telescopic relationship between the five individual parts of this pattern. This clearly may be seen from FIGS. **2** and **3** illustrating pattern configurations used to make two members of a family of axles, which members have vastly different dimensions.

In the configuration shown in FIG. **2,** projections **42** and **44** are received almost entirely in bores **34** and **36** respectively, and projections **26** and **28** are partially received in bore **20.** In the configuration of FIG. **3,** however, all of the projections **26, 28, 42, 44** extend to a great extent from the bores in which they are received to give the pattern **10** a relatively large overall length. It should be noted that pattern **10** can be adjusted into an asymmetrical configuration not shown to produce a correspondingly asymmetrical axle such as those used in certain off-road equipment applications.

The various elongate projections and the respective bores in which they are received and dimensioned to produce sliding fits facilitating quick adjustment of the relative positions of the parts. An acceptable sliding fit that may be utilized for the parts of pattern **10** is the American Standards Association Class RC1 Close Sliding Fit giving accurate location of the parts but allowing assembly without perceptible play. As an alternative to providing such fits, pattern **10** may be formed including a series of fastening means such as pins or spring loaded cams that do not alter the external configuration of the pattern, but may be effective to accurately locate the parts thereof while still providing for ease of adjustment.

It thus may be seen that this invention provides a casting pattern **10** that is capable of being adjusted to change its dimensions in at least two directions quickly and easily, thus allowing different relative positioning of various constant dimension parts and that is useful especially in the preparation of molds for an entire family of drive axle housings. Another advantage gained by use of the multiple piece pattern of this invention wherein the various pattern elements are telescopically received within one another is that at the point of transition between two pattern elements, the continuity of pattern material insures that no sudden break in mold material occurs when the mold is formed around the pattern. Thus, the continuous pattern provides for the formation of a natural fillet in the mold thus minimizing stress concentrations in the finished molded product. It easily may be recognized that when patterns are made from discrete individual pieces not having the telescoping relationship of this invention, slight spaces between these individual elements could provide sharp corners to be formed in the mold material resulting in undesirable stress concentrations in the finished cast product. It readily may be understood that if the degree of flexibility in size provided by the illustrated pattern **10** were not desired, a similar pattern utilizing the teachings of this invention could be prepared having only three distinct parts and two telescoping parts relationships rather than the five distinct parts and four telescoping parts relationships of the illustrated pattern **10.**

I claim:

1. A pattern for use in forming casting molds of different dimensions, said pattern having a central portion and a pair of satellite portions spaced from and on opposite sides of the central portion, an elongate projection extending from each of said satellite portions, and bore means opening from opposite sides of said central portion, said elongate projections being telescopically received within said bore means and slidable therein to adjust the distance between said central portion and each of said satellite portions and the overall length of said pattern.

2. A pattern for use in forming molds for the casting of a family of products, said products having a generally elongate form with a central portion of fixed dimensions and a pair of satellite portions of fixed dimensions spaced from said central portion, the distances between said central portion and said satellite portions being variable within said family of products, said pattern comprising a main body corresponding to said central portion, a pair of secondary portions corresponding to said satellite portions, each of said secondary portions having an elongate projection extending therefrom, said main body having openings formed therein on opposite sides thereof each projection being telescopically received in one of said openings and slidable therein to adjust the distance between said main body and each of said secondary portions and the overall length of said pattern.

3. A pattern for use in forming casting molds of different dimensions, said pattern having a central portion and a pair of intermediate portions spaced from and on opposite sides of said central portion, each of said intermediate portions having an elongate projection extending therefrom, said central portion having openings formed therein on opposite sides thereof, said intermediate portion projections each being telescopically received in one of said openings and slidable therein to adjust the distance between said central portion and said intermediate portions, each of said inter-

mediate portions having an opening formed therein on its side opposite said intermediate portion projections, a pair of end portions each having an elongate projecting extending therefrom, said end portion projections each being telescopically received in one of said openings in said intermediate portions and slidable therein to adjust the distances between said intermediate portions and said end portions.

* * * * *