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BICYCLE FRAME

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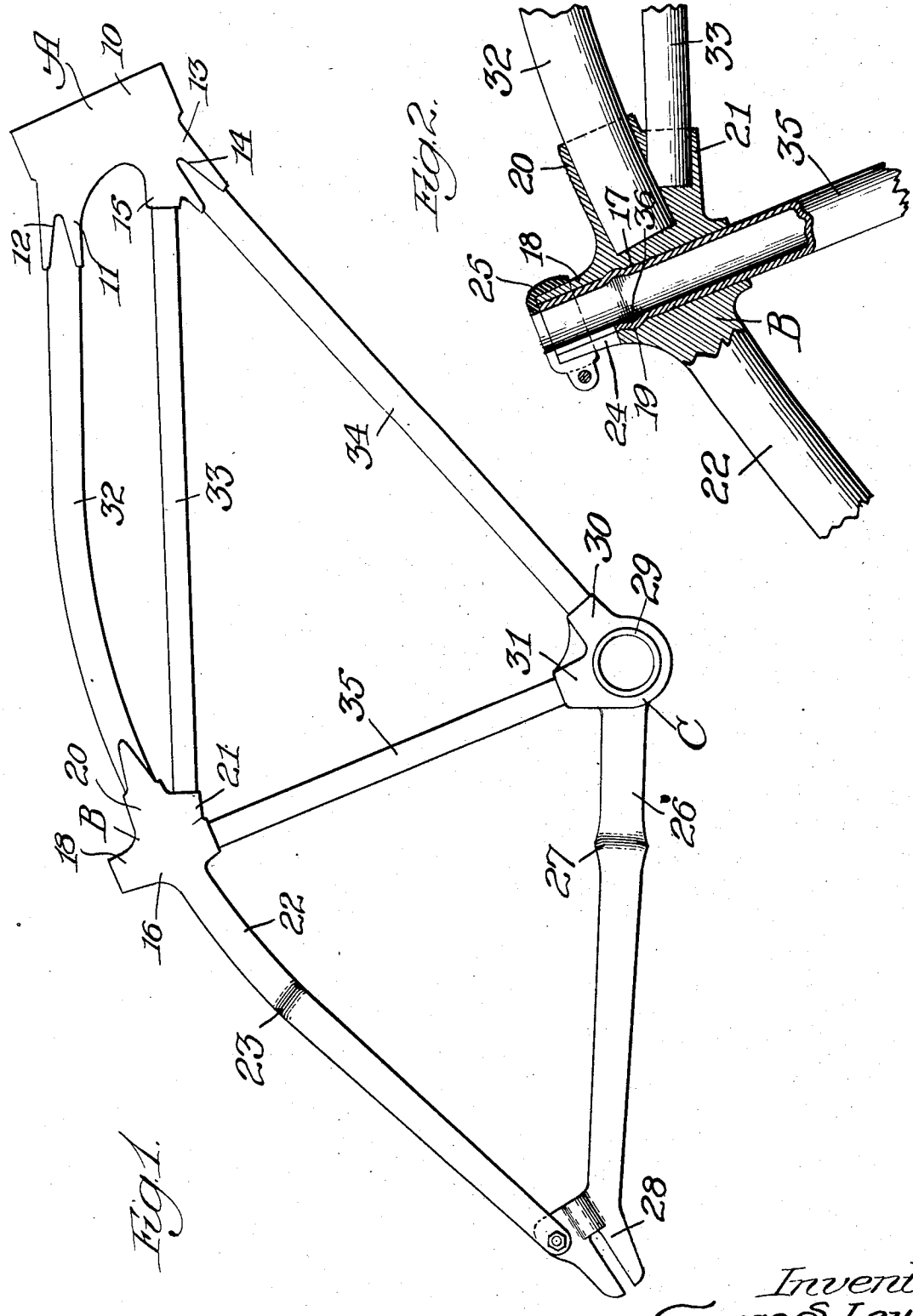


FIG. 1.

FIG. 2.

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BICYCLE FRAME

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7 Claims. (Cl. 208—95)

This invention relates to a bicycle frame or the like.

An object of the invention is to provide a bicycle frame of sturdy structure and novel design and a lightweight frame consisting of castings and tubes secured together without welding and without bolts, screws, and other like devices. Other specific objects and advantages will appear as the specification proceeds.

The invention is illustrated, in its preferred embodiment, by the accompanying drawing, in which—

Figure 1 is a side view in elevation of a bicycle frame embodying my invention; and Fig. 2, a broken enlarged sectional view of the cluster casting, the casting being equipped with a clamping collar.

In the illustration, A designates a head casting; B, a cluster casting; and C, a bearing casting.

The head casting A is preferably formed of a light metal such as duraluminum or other light and sturdy aluminum alloys. Preferably, the casting is designed to provide a streamline structure providing at its front a tubular part 10 adapted to receive the steering shaft and with a rearwardly extending tube 11 bifurcated at 12. Also, the casting is preferably provided with a downwardly inclined tube 13 bifurcated at 14. Merging with the tube 14 is a substantially horizontal tube 15.

The cluster casting B is provided with a main body portion 16 providing therethrough a central bore 17 and having an upwardly extending neck 18. It is preferably formed of the same material used in the forming of casting A. Near the lower portion of the neck 18 is an annular recess 19. The casting B is provided at its forward side with a tubular extension 20 which is preferably curved in contour and with a merging tubular extension 21 just below the tubular extension 20.

Integrally formed with the casting B is a rearwardly extending fork portion 22 which is bifurcated at 23.

The neck 18 of casting B is slotted at 24 and a clamp collar 25 is secured to the upper portion of the neck.

The casting C is also preferably formed of duraluminum or other suitable aluminum alloy. The casting is provided with a rearwardly extending fork portion 26 which is bifurcated at 27, and which is provided at its rear with a supporting head 28 in which the bearing of the rear wheel is secured. The head 28 on each of the forks is secured to the forks of the extension 23 of casting B. The casting C provides centrally a bearing 29 for the drive-axle and it is equipped with upwardly extending tubular parts 30 and 31.

The use of aluminum or aluminum alloys has been considered impractical owing to the comparatively low tensile strength of aluminum or aluminum alloys. To gain the proper strength therefore, so much metal would be required that the casting would be heavy and unwieldy. By modern processes, aluminum alloys may be heat treated to give a tensile strength comparable to steel, yet the weight be approximately only one-third the weight of a similar casting made of steel. Should, however, the casting after having been heat treated be subjected to a welding or brazing heat, the benefit derived from the heat treating process would be lost and the casting would be no stronger than ordinary commercial aluminum. It is apparent therefore that to preserve the strength of the heat treated alloy, no fusing temperature may be used. I have found that a temperature of 300° F. may be maintained for a limited time without danger or for a brief period, it is possible to go as high as 350° F.

I have found that an aluminum alloy frame of sturdy and simple construction can be produced through the use of aluminum castings to which tubing is joined by shrinking the castings upon the tubing. For example, one of the castings, say casting A, is heated, preferably in an oil bath, to a temperature of around 300° F. so that the tubular extensions 11, 13 and 15 expand sufficiently to receive connecting tubes which are normally too large to be received within the tubular extensions. I have found that a satisfactory joint can be made by having the tubes from 1/1000th to about 10/1000ths larger than the bore of the tubular extensions.

By the above method, I have connected the front casting A to the cluster casting B with the top tube 32. In the same manner, the cross tube 33 is secured within casting B and casting A. The casting A is secured to the casting C by tube 34 which is received within the tubular extension 13 of casting A and the tubular extension 30 of casting C. The tube 35 is likewise secured within the tubular extension 31 of casting C and the bore 17 of casting B.

If desired, the tube 35 may be expanded outwardly at 36 to form an interlocking engagement with the annular recess 19 of fitting B. Also, a similar interlocking engagement may be made between tube 35 and casting C, the expanding tube being extended through tube 35. The tensile strength of other connections may be likewise

increased between the castings by a similar expanding operation, if such increase in tensile strength is desired.

I have found that an extremely sturdy connection can be formed through the expansion of the casting by heat and the subsequent contraction thereof about a tube which is several thousandths greater in diameter than the diameter of the bore in the casting. Additional strength for the connection can be obtained by chilling the tube while also heating the casting. For example, the tube may be placed in dry ice or any other suitable cooling medium and its temperature reduced until a substantial contraction of the metal is obtained. When the chilled tube is then placed within the expanded bore of the casting, a substantial shrinking of the bore and expansion of the tube occurs which produces a very tight fit.

The frame may be assembled expeditiously and in a sturdy construction by forcing each of the tubes into telescoping relation with one of the tubular extensions of the head, cluster or hanger members, none of the parts being heated or chilled. In the pressing operation, the tendency of the aluminum alloy to tear and roughen along the contacting surfaces brings about a practically permanent connection.

It will be observed that in the design of the tubular extension 11 of casting A, tube 32 and casting B with the tubular extension 20 and the rearward fork extension 23, a substantially bow-like beam is produced with a substantially uniform curve in the central portion of the bow. The seat supporting neck 18 of the cluster casting B is located substantially in the center of the bow structure just described. I find that with this curved construction, a frame of unusual strength is obtained, and that I can use lighter materials than have heretofore been used in these portions of the frame. The structure is so strong that, if desired, the cross tube 33 may be omitted.

The resultant frame is light in weight, devoid of objectionable welding marks, screw and bolt connections, and is sturdy and substantially integral in construction.

In order to facilitate securing an effective shrunk fit, an aluminum alloy having a high lineal coefficient of thermal expansion is used. The particular alloy used, for example, has a coefficient about two and a half times that of ordinary cast iron, and slightly more than double that of steel. To secure a strong connection if iron were used for the castings in a bicycle frame, it would be necessary to hold the internal diameter of the opening in the casting and the external diameter of the tube within limits of less than a thousandth of an inch, limits not economically practicable in bicycle manufacture. The alloy used, on the other hand, permits manufacturing limits several times those possible with cast iron, due to its higher coefficient of expansion, and has a tensile strength, when properly treated, comparable to that of steel.

While I have described the castings as being secured to the tubes by shrinking the castings thereon, it will be understood that, if desired, the tubes may be expanded within the castings, or both methods may be used simultaneously; and in using the words "shrunk fit" in the appended claims, I intend to cover either or both methods. It will also be understood that my invention may be employed by forcing one of the tubes within or into telescoping relation with the tubular extensions of a casting. Such a force fit may be supplemented by passing pins or other connecting means through the telescoping parts.

While the head, cluster and hanger members have been described herein as castings, it will be understood that such members may be made by forging, as would be well understood by men skilled in the art; and in the appended claims where the word "casting" is used, it will be understood that this broader meaning of the term is intended.

The foregoing detailed description has been given for clearness of understanding only, and no unnecessary limitations should be understood therefrom, but the appended claims should be construed as broadly as permissible, in view of the prior art.

I claim:

1. In a bicycle frame of the character set forth, a plurality of castings of aluminum alloy equipped with tubular extensions, and tubes connecting said castings and gripped in telescoping relation with said tubular extensions in a shrunk fit.

2. In a bicycle frame of the character set forth, an aluminum alloy casting provided with a tubular extension, a tube telescopically engaging said extension and frictional gripped thereby, said casting being provided with a recess therein and said tube being expanded adjacent said recess to provide an interlocking shoulder received within said recess.

3. In a bicycle frame of the character set forth, a plurality of castings of aluminum alloy equipped with tubular extensions, and tubes connecting said castings and secured in telescoping relation with said tubular extensions by only the pressure exerted by said tube and tubular extension parts in frictional contact.

4. In a bicycle frame of the character set forth, a plurality of castings of aluminum alloy equipped with tubular extensions, tubes connecting said castings and having their end portions gripped tightly in telescoping relation with said tubular extensions, and locking means engaging said tubes and tubular extensions to prevent the separation thereof.

5. In a bicycle frame of the character set forth, a head member, a cluster member, and a hanger member, said members being formed of aluminum alloy and provided with tubular extensions, tubes telescopically engaging said tubular extensions to connect said members, said tubes and tubular extensions being held together by a force fit only.

6. In the method of assembling a bicycle frame having a cluster casting, a hanger casting and a head casting, each casting being of aluminum alloy and provided with integral tubular bosses, and tubes connecting the castings, the step of pressing said connecting tubes into telescoping relation with said bosses under sufficient pressure to form a substantially permanent tight force fit.

7. In the method of assembling a bicycle frame having a hanger casting and a head casting, each casting being of aluminum alloy and provided with integral tubular extensions, and tubes connecting the castings, the step of pressing said connecting tubes into telescoping relation with said extensions under sufficient pressure to form a substantially permanent tight force fit.

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