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METHOD OF MAKING MINING MACHINE CHAIN LUGS

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2 Sheets-Sheet 2
My invention relates in general to chain lugs and more particularly to method of making mining machine chain lugs.

In the mining of coal or other substances, a mining machine chain is arranged to be positively driven around a 'cutter bar' by means of a sprocket wheel. If the chain is not properly designed, it tends to sag, jump, buckle, or not run smoothly to give good results. In the construction of my chain, I have given particular attention to this problem, and have designed my chain to avoid the foregoing mentioned objections, as well as to give increased efficiency of operation and long life.

Therefore, an object of my invention is the construction of a mining machine chain which runs smoothly and avoids sagging, jumping, buckling.

Another object of my invention is the provision of enabling every lug in the chain to become a bit-carrying lug, or of enabling every other lug or any other member, to become a bit-carrying lug with intervening lugs having no bit-carrying lugs.

Another object of my invention is the provision of providing a tooth socket recess for the sprocket wheel in every lug of the chain.

Another object of my invention is to simplify the construction of the chain lug by making parts of identical construction.

Another object of my invention is the provision of a mining machine chain which may be manufactured with a standard pitch and accommodate any ratio of gearing of the mining machine and yet maintain the cutting speed within certain operating limits.

Another object of my invention is the process of making a chain lug of identical parts and of employing a spacer to facilitate the construction of chain lugs of various thicknesses.

Another object of my invention is the provision of facilitating the ready insertion or removal of a chain lug from the chain.

Another object of my invention is the provision of a pin-type connection for connecting the chain lug together, in which the pin may be easily and readily inserted or removed when assembling or disassembling a lug in the chain.

Other objects and a fuller understanding of my invention may be had by referring to the following description and claims, taken in conjunction with the accompanying drawings, in which:

Figure 1 is a plan view of a one-half part of my chain lug;

Figure 2 is a plan view of two of the one-half parts welded together;

Figure 3 is a side elevational view of Figure 2;

Figure 4 is an end view of my bit-carrying body which is to be welded to the parts shown in Figures 2 and 3 to make the completed chain lug;

Figure 5 is an end view of the completed chain lug;

Figure 6 is a perspective view of a tying or bridging member which is adapted to be welded to the two parts shown in Figures 2 and 3 to make a chain lug without a bit carrying body;

Figure 7 is a plan view of two lugs of my chain, in which one chain lug is embodied with a bit carrying body and in which the other lug is without a bit carrying body;

Figure 8 is a side elevational view of Figure 7;

Figure 9 is a cross-sectional view taken along the line 9-9 of Figure 8 and showing my improved pin-type connection for holding the chain lugs together;

Figure 10 is a cross-sectional view taken along the line 10-10 of Figure 9;

Figure 11 is a perspective view of the connecting pin for holding the chain lugs together;

Figure 12 is a perspective view of a bushing through which the pin in Figure 11 fits;

Figure 13 is a side elevational view of a spring which fits between the bushing and the pin to keep the pin from coming out of the bushing;

Figure 14 is a side elevational view of a cutter bar showing my chain as it appears thereon;

Figure 15 is a plan elevational view of my chain in which every lug of the chain is a bit-carrying lug;

Figure 16 is a side elevational view of a modified arrangement of my chain lug assembly;

Figure 17 is a view similar to Figure 2 with a spacer between the two parts to vary the width of the chain lug;

Figure 18 is a fragmentary cross-sectional view, taken on line 18-18 of Figure 8, and shows primarily a tooth of the driving sprocket and a tooth recess in a chain lug, and

Figure 19 is a cross-sectional view, taken on line 19-19 of Figure 14, and shows primarily the guiding of the chain in the cutter bar.

With reference to Figures 1, 2 and 3 of the drawings, my chain link is constructed of two identical parts 20. The two parts 20 are described as being identical, although one may be characterized as a left-handed part and the other as a right-handed part. They are arranged to be matched together and then welded
to make the complete link of the chain. Each of the identical parts 20 is provided with an eye connection portion 21 and a yoke connection portion 22, each having rounded ends. The eye connection portion 21 has an eye opening 23 and the yoke connection portion 22 has a yoke opening 24. The top edge of each of the identical parts 20 is provided with lateral flanges 25 and the bottom edge thereof is provided with a laterally extending gib 26 for engaging the cutter bar.

The inner side wall 31 and the outer side wall 32 of the eye connection portion and the inner side wall 33 and the outer side wall 34 of the yoke connection portion are respectively off-set relative to each other by an amount to make the inner side wall 33 of the yoke connection portion to lie in substantially the place as the outer side wall 32 of the eye connection portion. Accordingly, when the two halves 20 are registered and welded together the inner side walls 33 of the yoke connection portion are spaced apart by a distance slightly greater than the thickness of the two registering eye connection portions. The weld for holding the two inner side walls 31 of the eye connection portion 21 together may extend between the reference characters 35 and 36, and between the reference character 39 and 40, as shown in Figure 3, giving two welding regions between the parts.

After the two identical parts 20 are registered and welded together, the next step in the construction of my mining machine chain lug is to weld or otherwise fasten the bit carrying body 41 thereto. As shown in Figure 4, prior to the welding of the bit carrying body 41 to the chain link, the bottom thereof may be cut in either one of four different planes represented by the planes 44, 45, 46 and 47, depending upon the desired amount of staggering of the bit carrying body.

In constructing a mining machine, some of the bit carrying bodies are staggered with respect to the other bit carrying bodies in order to cut a cleft in the vein of coal. This staggering is accomplished by cutting the block 41 as shown in Figure 4 along either one of the four different positions indicated by the reference characters 44, 45, 46 and 47. In other words, a chain lug may be constructed with the bit carrying body positioned perpendicular or with the bit carrying body assuming any one of many staggered positions upon either side of the center line of the chain, making a total of many different positions. The bit carrying body 41 is welded to the top surfaces of the lateral flanges 25 along the juncture between the bit carrying body and the top surfaces of the flanges 25 as indicated by the reference character 48. The bit carrying body may be provided with a bit holding socket 42 having opposing set screw openings 43 and may comprise a bit carrying body substantially as shown in my pending application Serial No. 364,515, filed November 4, 1940, now Patent No. 2,255,856 and entitled Reversible mining machine chain lugs.

With my type of chain lug, every lug of the chain may become a bit carrying lug or my chain may be arranged that every other or alternate chain lug, or any other number of chain lugs may become a bit carrying lug with the intervening lugs having no bit carrying lug. This is shown in Figure 7, in that the right hand lug 37 is a bit carrying lug and in that the left hand lug 38 is constructed without a bit carrying body. The lug 39 having no bit carrying body is constructed of the two same identical parts 20 as shown in Figures 2 and 3, but instead of welding the bit carrying body 41 thereto, I weld a tie or bridge plate 45 to the top edge surfaces of the flanges 25, the weld being indicated by the reference character 50. The welding of the bit carrying body 41 and the tie plate 45 to the top surfaces of the lateral flanges 25 reinforces the yoke connection portions 22 and prevents them from spreading or otherwise moving out of alignment.

In assembling the complete chain, the eye connection portion fits in between the bit carrying body portion of the next adjacent chain and are connected together by means of a bushing and pin connection, which comprises a bushing 51 and a pin 52 having a flat face 53. The outside diameter of the bushing is such as to fit snugly in the opening 23 in the eye connection portion. The bushing 51 is provided with an internal groove 55 into which snaps a resilient spring wire 56. The pin 52 is provided with an external groove 57, so that upon the insertion of the pin 52 within the opening of the bushing the bushing spring 51 holds the pin therein by reason of the engagement effected between the snap spring 56 and the internal groove 55 of the bushing and the external groove 51 of the pin. The yoke opening 24 is provided with a flat face 54 so as to keep the pin 52 from turning within the yoke connection portion 22. In this manner all the relative movement takes place between the outer circumference of the bushing 51 and the inner surface of the eye opening 23 of the eye connection portion. Therefore, upon removing a chain lug from the chain, it is only necessary to punch out the pin and upon the mounting of a chain lug into a chain it is only necessary to drive the pin 52 into the bushing 51. In other words, the pin 52 may be inserted or removed without the use of wrenches or special tools.

In operation, the chain is driven by a sprocket wheel around a cutter bar 59 and each of the chain lugs is provided with a tooth socket to receive the sprocket teeth 59. One side of each tooth socket is formed by the rounded end of the eye connection portion 21. The outside surface of the weld between the reference characters 35 and 36 is substantially even with the rounded end of the eye connection portion 21, as the mating marginal edges between the reference characters 35 and 36 are bevelled at 29 to receive the welding material. The other side of the tooth socket is formed by the rounded surface 27 of the eye connection portion at the juncture of the offset between the eye connection portion and the yoke connection portion, see Figure 8. The juncture of the offset between the eye connection portion and the yoke connection portion is not a square offset but is a gradual curved, or angular offset so that the surface 27 contacted by the sprocket teeth is closer to the center of the opening 23 than the external offset shoulder 28 on the outside side of the lug, see Figure 3. The gradually curved or angular offset provides a strong integral connection between the eye connection portion and the yoke connection portion, as the pulling force upon the chain in this region is not concentrated as a shearing force but as a linear force directed angularly which absorbs the shock. The inside end 27 of the tooth socket for each lug of the assembled chain is curved at the offset juncture and is engaged complementarily by the sprocket teeth, see Figure 18.

The driving of each lug of the chain by a sprocket tooth enables my chain to run smoothly.
without buckling, jumping or sagging. The buckling of the chain is avoided by the abutting ends 60 and 61 of the lateral flanges 25 engaging each other and forming effective stops to prevent the lugs of the chain from cocking or jamming in the cutter bar. Thus, the lateral flanges 25 serve substantially five functions, namely, (1) to provide surfaces to weld the bit carrying body 41 or the tie plate 48 thereto, (2) to give lateral stability to the side walls of the yoke connection portion; (3) to provide wearing surfaces against the top of the wearing plate 62 of the cutter bar, (4) to prevent the chain from sagging downwardly, and (5) to prevent the lugs of the chain from jamming. The bottom gibs 28 have an arcuate upper edge surface 63 so that as the chain lug passes around the rounded or forward end of the cutter bar the upper arcuate surfaces 63 form a somewhat continuous and curved contact with the channel in the cutter bar to keep the chain lug from jamming and thus well sustained for cutting operation, see Figure 14.

In Figure 15, I show each lug 64, 65, 66 and 67 of my chain having a bit carrying body, staggered with respect to each other so that the set screws in opposite ends of the bit carrying body avoid striking or engaging other set screws in adjacent bit carrying bodies.

In Figure 16 I show a modification of my invention in that the tie plate 68 is welded in such a position that it makes an abutting engagement at 69 with the bit carrying body at 70 as to keep the chain from sagging. With this modification, the abutting ends 60 and 61 of the flanges 25 may be dispensed with, or the resistance to sagging may be effected by employing both the abutting ends 60 and 61 as well as the tie plate 68 engaging the bit carrying body. The coal dust and other particles which fall through the bit holding socket may escape to the outside through the dust opening 71 in the side wall of the yoke connection portion 22.

In Figure 17, I show a spacer 75 between the two identical parts 20 to vary the thickness of the chain. The spacer 75 may be of any desired thickness to make the width of the chain accommodate varying operating conditions.

Due to certain limits in operating speeds of cutting chains, it has been important heretofore that chains be built of a certain pitch in order that the pitch diameter of the driving sprocket be of a dimension which can be accommodated by the gearing of the machine. Since my chain accommodates a sprocket tooth in every juncture or lug of the chain and since the chain can be operated on a sprocket of an uneven number of teeth as well as an even number, it becomes possible to manufacture chains into a standard pitch which can be accommodated by any ratio of gearing and yet maintain the cutting speed the gearing permits.

Although I have described my invention with a certain degree of particularity, it is understood that the present disclosure has been made only by way of example and that numerous changes in the details of construction and the combination and arrangement of parts may be resorted to without departing from the spirit and the scope of the invention as hereinafter claimed.

I claim as my invention:

1. The method of constructing a mining machine chain lug having a link portion and a bit carrying body portion mounted on the top of the link portion, said link portion having at one end thereof an eye connection portion and having at the other end thereof a yoke connection portion, said method comprising the steps of making the link portion by constructing two substantially allochiral link members, the steps of making each link member including forming on one end thereof an eye connection portion with substantially flat inner and outer surfaces and on the other end thereof a yoke connection portion with substantially flat inner and outer surfaces, and laterally offsetting the inner and outer surfaces of the yoke connection portion relative to the inner and outer surfaces, respectively, of the eye connection portion so that the two substantially allochiral link members together form the completed link portion by placing the two inner surfaces of the yoke connection portion against each other and then welding the two eye connection portions together with the yoke connection portions spaced apart to receive the eye connection portion of an adjacent chain lug, making a bit carrying body portion and welding the bit carrying body portion to the top of the two link members to make the finished chain lug.

2. The method of constructing a mining machine chain lug having a link portion and a bit carrying body portion mounted on the top of the link portion, said link portion having at one end thereof an eye connection portion and having at the other end thereof a yoke connection portion, and method comprising the steps of making the link portion by constructing two substantially allochiral link members, the steps of making each link member including forming on one end thereof an eye connection portion with substantially flat inner and outer surfaces and on the other end thereof a yoke connection portion with substantially flat inner and outer surfaces, and laterally offsetting the inner and outer surfaces of the yoke connection portion relative to the inner and outer surfaces, respectively, of the eye connection portion so that the two substantially allochiral link members together form the completed link portion by placing the two inner surfaces of the yoke connection portion against each other and then welding the two eye connection portions together with the yoke connection portions spaced apart to receive the eye connection portion of an adjacent chain lug, making a bit carrying body portion and welding the bit carrying body portion to the top of the two link members to make the finished chain lug.
faces, respectively, of the eye connection portion, fastening the two substantially allochiral link members together to form the completed link portion by placing the two inner surfaces of the eye connection portions against each other with the rounded ends registering and then welding the rounded ends together with the yoke connection portions spaced apart to receive the eye connection portion of an adjacent chain lug, making a bit carrying body portion and welding the bit carrying body portion to the top of the two link members with the bit carrying body portion spanning the space between the spaced yoke connection portions to make the finished chain lug.

4. The method of constructing a mining machine chain lug including a link portion provided at one end thereof with an eye connection portion and at the other end thereof with a yoke connection portion, said method comprising the steps of making the link portion by constructing two substantially allochiral link members, the steps of making each link member including forming on one end thereof an eye connection portion with substantially flat inner and outer surfaces and on the other end thereof a yoke connection portion with substantially flat inner and outer surfaces, and laterally offsetting the inner and outer surfaces of the yoke connection portion relative to the inner and outer surfaces, respectively, of the eye connection portion, fastening the two substantially allochiral link members together to form the completed link portion by placing the two inner surfaces of the eye connection portions against each other and then welding the two eye connection portions together with the yoke connection portions spaced apart to receive the eye connection portion of an adjacent chain lug, making a bridge connecting member, and welding the connecting member to the top of the two link members with the connecting member spanning the space between the spaced yoke connection portions to make the finished chain lug.

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