Nov. 8, 1949 J. B. WEBB 2,487,500

CONVEYER CHAIN

Filed Oct. 22, 1943

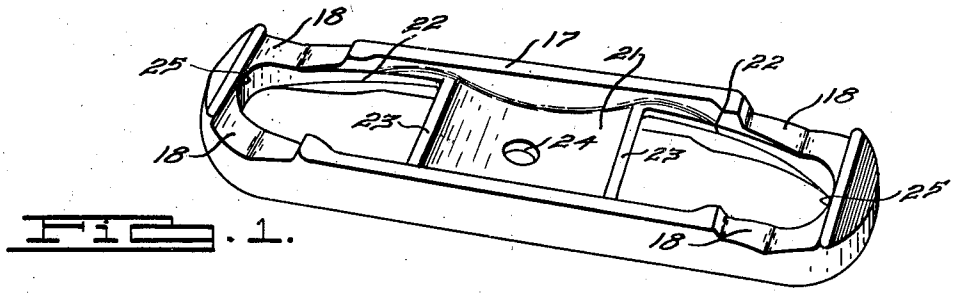


Fig. 1.

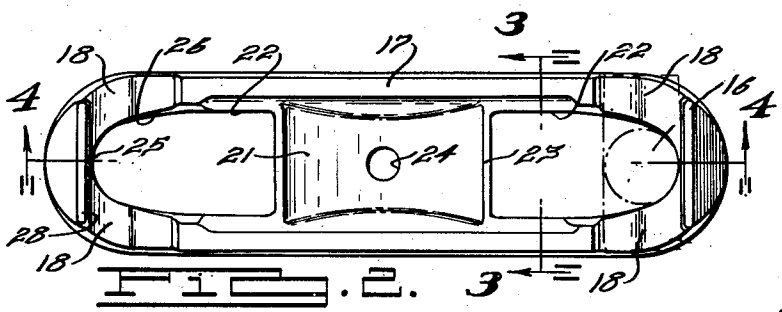


Fig. 2.

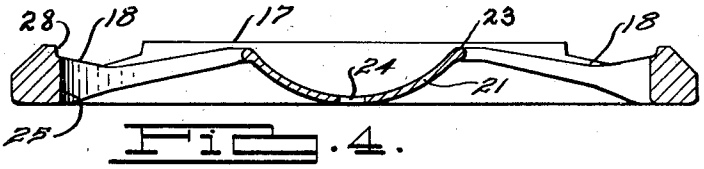


Fig. 4.

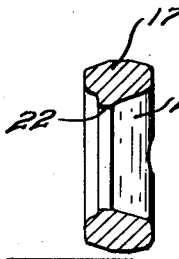


Fig. 3.

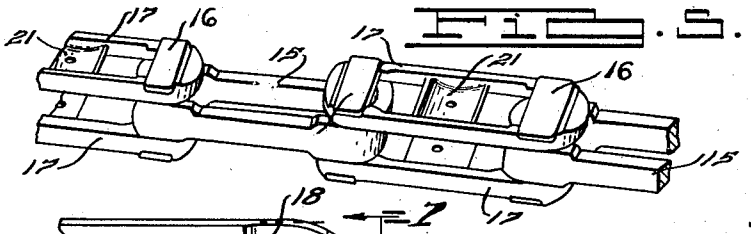


Fig. 5.

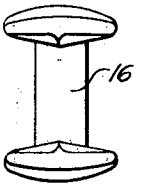


Fig. 9.

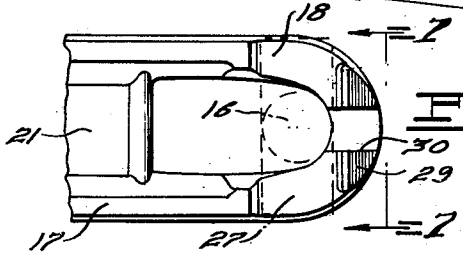


Fig. 6.

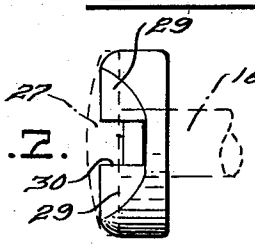


Fig. 7.

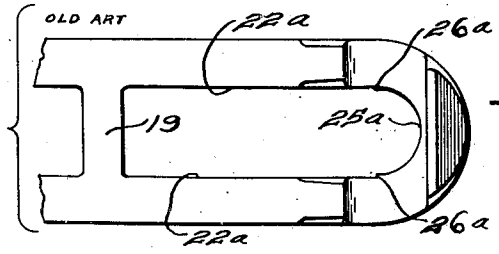


Fig. 8.

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CONVEYER CHAIN

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7 Claims. (Cl. 74—254)

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This invention relates to a particular type of chain variously called "keystone," "rivetless" or "Weston" chain which, for many years, has had wide application in conveyors, mining machinery and other industrial uses.

The original rivetless chain which was the subject matter of Weston Patent No. 870,704, consists of a plurality of "center links" and side bars, as they are termed in the art. Each center link consists of an integral piece of metal having a pair of laterally spaced side walls joined at their ends by curved end walls, said side and end walls enclosing or surrounding an elongated slot. A pair of side bars each having an elongated slot at each end is pivotally connected to each end of each center link by headed pins, each pin having a transverse head on each end thereof similar to the headed end of a T-head machine bolt. The side bars are formed at their ends with transversely extending recesses on their outer faces in which the heads of the pins are seated to lock the pins in position after the center links and side bars have been coupled together. Each of the center links has a narrowed central portion which tapers outwardly adjacent to the ends of the link to form thickened portions at the link ends. The center links and side bars are assembled by holding the elongated slots in the ends of a pair of side bars one on each side of the center link at the central portion of the elongated slot of the center link and in parallelism therewith, then inserting the headed end at one end of a headed pin through the three slots, next turning the side bars at a right angle to the center link and seating the heads of the pins in the transverse slots at the ends of the side bars, after which the pair of side bars and the headed pin are slid toward a thickened end portion of the center link whereby said thickened portion holds the side bars spread apart sufficiently to maintain the transverse T-heads on each pin within the transverse recesses in the outer faces of the side bars, thus holding the side bars and center links pivotally secured together. When the center links and side bars are assembled to form a length of chain, the side bars and center links are arranged in alternate relationship along said chain, each center link having connected to each end thereof a pair of spaced side bars and each such pair of side bars being connected at each end to an adjacent center link and so that pivotal movement is permitted between the adjacent center links and side bars about the center of said headed pins as an axis.

In addition to the great strength of this chain

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its principal features are its adaptability as a sprocket chain, the absence of rivets, and the ease in which individual links may be removed from or added to the chain. While attempts have been made to devise other types of chain having the same rivetless feature, only the Weston type has taken hold in the trade and, except for the improvements recently shown by Herman 2,264,529 and Webb 2,298,604, the form of the chain has remained without significant change from that originally shown by Weston in 1907. This invention is directed to improving the Weston chain, as modified by Webb and Herman, by improvements in the side bar used in such a chain, but of course the improvements can be applied in greater or less degree to other "rivetless" chains.

The Weston chain, due to its peculiar form and due, perhaps also, to the fact that it often drags along on floors or in troughs, etc., occasionally picks up bolts, screws, and small stray pieces of metal which become caught in the linkage. This frequently results in damage to the driving mechanism or the chain itself and interruption of plant operations. In fact, there have been instances in which plant operations have been sabotaged by the insertion of foreign objects, such as screw drivers or wrenches, in the linkage of such a chain. One object of this invention is the provision of a rivetless chain in which the accidental or intentional clogging of the chain by foreign objects is made less likely or more difficult.

These chains are generally forged of steel. The tolerances attainable in forging practice are sufficiently close to permit the pins and parts of the chain to be used as forged, however, certain locations which govern the pitch of the chain are customarily machined to closer limits. Burrs and rough or sharp edges often occur at the edge of the machined locations. Another object of this invention is to provide a chain which will be so shaped that the machining which follows the forging operation will not create any such burrs or rough or sharp edges.

A further object of the invention is to follow the teaching of Webb 2,298,604 and use a high or thickened side bar so as to prevent misassembly and at the same time to locate the thickest dimension at the outside of the side bar where the extra thickness will provide additional side wearing surfaces.

In forging these chains, much stock is wasted in the form of flash which is cut off in the last part of the forging operation. A further object

of this invention is to utilize a substantial portion of this otherwise wasted flash formed in the interior of the side bar of the chain for the purpose of preventing clogging, preventing misassembly, strengthening the link, of furnishing a panel-like area for a name-plate and by so curving the panel to insure proper engagement with the drive.

Occasionally, and due to inaccuracies in manufacture, improper wear occurs between the pin and the side bars of the chain, particularly when the chain is at a curve. An additional object of the invention is to so shape the side bar and the lock lugs thereon that wear of this type will not occur.

These and other objects of the invention will become more apparent from the following description and the accompanying drawings in which

Fig. 1 is a perspective view of the side bar of the chain.

Fig. 2 is a plan view of the side bar.

Fig. 3 is a transverse sectional view taken along the line 3—3 of Fig. 2.

Fig. 4 is a longitudinal vertical sectional view taken along the line 4—4 of Fig. 2.

Fig. 5 is a view, in smaller scale, showing the entire chain, as assembled.

Fig. 6 is a fragmentary plan view of a modified form of the invention which may be compared with Fig. 2.

Fig. 7 is an end view of the form shown in Fig. 6.

Fig. 8 is a fragmentary view of a chain link as heretofore used in practice. This drawing from the old art is included herein for purpose of comparison with Fig. 2.

Fig. 9 is a side elevation of the locking pin employed in the assembled chain of Fig. 5.

The assembled chain, as shown in Fig. 5, consists of three separate and different parts, called center links 15, locking pins 16 and side bars 17. One unit or pitch of the chain consists of a center link 15, two side bars 17 on either side of the center link and two locking pins 16, each of which extends from the top of one side bar, through the center link and to the bottom of the other side bar so as to join the center links and side bars in end-to-end relationship. As shown in Fig. 5, successive units may be joined together to form a chain of any desired length. As this invention deals particularly with the side bar used in the chain, reference is made to Weston 870,704 for an explanation of the manner in which the chain is assembled or disassembled or units are added to it or removed.

Turning now to the side bar 17, its general form and shape is shown in perspective in Fig. 1. In its essentials the side bar is a long narrow loop provided with notches 18 at each end formed to receive the head of a locking pin 16. The dotted outline on the right-hand side of Fig. 2 shows the exact position of such a locking pin 16.

These side bars, as well as the other parts of the chain, are commonly forged from solid pieces of stock, the metal from the central portions of the stock being, through successive operations, forced out to the sides to form the desired shape. As in all forging operations, there is a flash, or thin web of metal, which surrounds the object and which stretches across the location of any apertures in the finished piece. The last forging operation is to punch out the flash.

In order to avoid distortion of the shape of the link in operation and particularly at turns of a

conveyor line, the old practice was to provide a narrow strut 19 in the center of the side bar, see Fig. 8 which is taken from the old art. However, instead of forming such a strut, this invention takes advantage of the flash formed in the forging and utilizes part of the flash as structural part of the side bar. As shown in Figs. 1, 2 and 4, the side bar 17 is not provided with the conventional center strut of the old art—instead there is a relatively thin web or panel 21 which extends across the inner part of the side bar 17, leaving an aperture 22 at either end barely large enough to allow the head of a locking pin 16 to be inserted in the end of the side bar. The web 21 is the residue of the original inside flash which was formed in the forging operation and which extended from side to side and from end to end of the side bar 17. Instead of punching out this entire flash only the end portions are punched out to form the holes 22 and the balance of the flash forms the web 21 shown in the finished product, Fig. 1. The web 21 is, of course, quite thin. Some slight thickening at its ends, as at 23, may be desired as a protection against fracture during heat treating or when in use.

It will be noted that the web or panel 21 is curved so that its ends 23 are near the top surface of the side bar 17, whereas the center portion is flush with the bottom of the side bar 17. Such a curvature, in itself, is desirable in order to give a stronger construction, but the reason for placing the central part of the web 21 flush with the bottom of the side bar 21 is an operating one which calls for explanation. These chains are ordinarily driven by sprocket wheels, the teeth of which project between two opposed side links 17 and engage and drive the ends of the center bars 15. In certain unusual conditions it might be that the chain could become cocked or tilted with relation to the drive sprocket and a tooth of the sprocket might, upon entering engagement, catch in an irregularity in the underside of the side bar 17. The web 21, being a smooth surface which curves to a point flush with the bottom of the side bar 17, will guide the chain and sprocket tooth into proper engagement should there be a slight angular misplacement.

The hole, 24, in the center of the web 21 is provided for drainage should any liquid drip on the chain as it travels through the plant.

It may be noted that the side bar embodies the principles shown in Webb 2,298,604—that is to say, at no place throughout the length of the side bar 17 can the locking pin 16 seat as low as it can in the recesses or notches 18. Therefore, the chain can be assembled only when the locking pins are in their proper position. This beneficial result is accomplished by having the sides of the side bar 17 intermediate the notches 18 uniformly higher than the height of these notched areas. Insofar as assembly is concerned, it may seem a matter of indifference whether the highest part of the side of the side bar is along the inside edge, the middle (as in Webb 2,298,604), or the outside edge. In this invention the side of the side bar 17 is highest at the outside edge—see Fig. 3 where a transverse cross-section of the side bar 17 may, after making due allowance for rounding of edges, roughly be compared to two opposed triangles having their apexes pointing inwardly. This brings more metal, and hence more wearing and bearing surface to the outside edge of the side bar.

With one exception, some slight variations in the outside and inside dimensions of the side bar

17 are tolerable. The exception is the inside distance between the ends—in other words, the distance between the cylindrical section 25 at each inside end of the side bar 17. This distance is one of the distances which determines the pitch of the chain at is locates the locking pins 16 and hence fixes the distance between successive units.

In the manufacture of the chain, the practice in the past, as shown in Fig. 8, has been to forge the slots 22 with parallel sides 22*a* and with an end part 25*a* in the shape of a half circle slightly smaller in diameter than the width of the slots 22 and then to machine the half circle sections 25*a* to the correct size and the correct distance from one another. This gave the side bar shaped as shown in Fig. 8 (old art). However, the transition between the machined portion 25*a* and the forged sides of the slots 22 is not smooth—on the contrary, a corner, as at 26*a* of Fig. 8, and even a burr, oftentimes exists at the edge of the machined section. If there is any play in the locking pin, the burr or corner at this point is apt to cause unusual wear on the locking pins 16 and ultimately a change in the pitch.

The side bar of this invention has a different shape than the side bar of the conventional chain. As shown in Fig. 2, the sides of the slot 22 are not parallel. Near the center of the side bar the slot is appreciably wider than the diameter of a locking pin 16, but it tapers down so that at the end, and at the point where the locking pin engages, the width of the slot 22 is just sufficient to accommodate the pin. The tapered portion is designated as 26 on Fig. 2 and it will be apparent that some tolerance in the exact location of the cylindrical end section 25 is permissible without effecting a sharp or abrupt change anywhere in the contour of the slot 22. In other words, the tapering section 26 has avoided the cause of any sharp corner as at 26*a* in Fig. 8, and the possibility of wear on the locking pin 16 is reduced.

In Figs. 6 and 7 is shown a modification of the side bar 17, intended further to reduce the possibility of wear and loss of exact pitch.

When the chain is assembled, the locking pins 16 are locked against rotation relative to the side bars 17 by the engagement of the T-shaped heads 27 of the pins with the slots 18, as clearly shown in Fig. 5. As the chain is in tension, the locking pins are normally urged endwise and toward the farther face or end shoulder 28 of the slots 18. By correctly locating this end shoulder 28 with relation to the surface 25, any possibility of play between the pins 16 and the side bar 17 can usually be avoided. If, however, the T-shaped head 27 of the locking pins 16 is not accurately formed, it may bear against the middle of the shoulder 28 rather than against the ends and thus permit rocking of the locking pin 16 and rotation and wear. In the embodiment shown in Figs. 6 and 7, such a possibility is avoided by removing the middle portion of the end shoulder 28. As shown therein, the end shoulder 28 is formed by two bosses 29 on either side of the end of side bar 17 leaving a space 30 between the bosses. The bearing on the head 27 is necessarily at the ends thereof and, hence, variations in the middle portion of the head 27 will have no effect on the assembly and cannot become the cause of rocking of the locking pin 16.

From the foregoing those familiar with the art will readily appreciate the advantages of the chain in actual practice.

In the first place, there is the provision of the web or panel 21, formed from the original flash. A comparison between Figs. 2 and 8 shows that the aperture 22 is much smaller than the old aperture 22*a*, especially after the locking pin 16 is in place. Thus there is much less chance that a stray bolt or a screw driver or any other foreign object may accidentally or intentionally become enmeshed in the aperture and cause breakage of the chain. Also the extra length of the web 21 compared with the narrow strut 19 is a further protection against distortion of the side bar 17. Again, the extra length of the web 21 takes advantage of the teachings of Herman 2,264,529 and would prevent the misassembly of the chain even though the portions of the side bar 17 centrally of the recessed areas 18 were thinned down as in the old art. Lastly, the web 21 furnishes an excellent location for a name or trade-mark.

Second: by making the web or panel 21 curved, the strength of this thin section is improved and misengagement with the driving mechanism is prevented.

Third: the high edge on the side bar prevents misassembly.

Fourth: the non-rectangular section in the side of the side bar, by which more surface is brought to the outside edge of the side bar, offers more wearing area.

Fifth: there is the taper 26 in the slots 22. By this taper customary methods of manufacture can be used without resulting in corners or burrs which cause wear and loss of pitch.

Sixth: and in the alternative form shown in Figs. 6 and 7, there is the relief 30 which divides the end shoulder 28 and eliminates the possibility that a slightly misformed locking pin 16 may rock when the chain is going around a curve.

Those skilled in the art will readily conceive of various modifications and changes in the particular form of the invention shown herein and in the adaptation of the form shown herein to other types of rivetless chain—all without departing from the full scope of the invention as defined by the appended claims.

I claim:

1. A side bar for a conveyor chain of the type wherein the chain is composed of a series of slotted links each of which is connected to its adjacent link by a pair of side bars and by headed locking pins which pivotally and detachably connect the ends of said links to the adjacent ends of a pair of side bars, characterized by said side bar having at each extreme end an end shoulder for engagement with the ends of the head of one of said locking pins and the middle part of said end shoulder being relieved as to avoid contact with said head.

2. A side bar for a conveyor chain of the type wherein the chain is composed of a series of slotted links each of which is connected to its adjacent link by a pair of side bars and by headed locking pins which pivotally and detachably connect the ends of said links to the adjacent ends of a pair of side bars, characterized by said side bar being constructed with the interior filled by a web, the thickness of such web being substantially equal to the thickness of the flash which would remain in the center portion of a side bar constructed as a forging from a solid piece of material, except at either end of said side bar where apertures are provided sufficient to permit the insertion of said headed locking pins, said side bar having at each extreme end an end shoulder for engagement with the ends of the head of one

of said locking pins, and the middle part of each of said end shoulders being relieved as to avoid contact with said head.

3. A side bar for a conveyor chain of the type wherein the chain is composed of a series of slotted links each of which is connected to its adjacent link by a pair of side bars and by headed locking pins which pivotally and detachably connect the ends of said links to the adjacent ends of a pair of side bars, characterized by said side bar having its side portions non-rectangular in section, the largest face of said section facing outwardly so as to present an increased wearing surface.

4. A side bar for a conveyor chain of the type wherein the chain is composed of a series of slotted links each of which is connected to its adjacent link by a pair of side bars and by headed locking pins which pivotally and detachably connect the ends of said links to the adjacent ends of a pair of side bars, characterized by said side bar having a longitudinally curved central panel of thin section extending between the sides of said side bar.

5. A side bar for a conveyor chain of the type wherein the chain is composed of a series of slotted links each of which is connected to its adjacent link by a pair of side bars and by headed locking pins which pivotally and detachably connect the ends of said links to the adjacent ends of a pair of side bars, characterized by said side bar having a longitudinally curved central panel of thin section extending between the sides of said side bar, the middle of said panel being flush with the inside surface of said side bar, and the ends of said panel terminating in transversely extending thickened ribs to form with said panel reinforcing means for resisting distortion of said side bar.

6. A side bar for a conveyor chain of the type wherein the chain is composed of a series of slotted links each of which is connected to its adjacent link by a pair of side bars and by headed

locking pins which pivotally and detachably connect the ends of said links to the adjacent ends of a pair of side bars; characterized by said side bar being constructed with an aperture at either end for receiving one of said locking pins and with a central strengthening web having a curved longitudinal cross section extending between said apertures.

7. A side bar for a conveyor chain of the type wherein the chain is composed of a series of slotted links each of which is connected to its adjacent link by a pair of side bars and by rectangularly headed locking pins which pivotally and detachably connect the ends of said links to the adjacent ends of a pair of side bars; characterized by said side bar being constructed with an aperture at each end for receiving one of said locking pins and with a central strengthening web having a curved longitudinal cross section extending between said apertures, the outer end of each such aperture being formed in the arc of a circle and the sides of each such aperture flaring gradually and smoothly from said arc, said side bar having at each extreme end an end shoulder for engagement with the ends of the head of a locking pin, and the middle part of each of said end shoulder being relieved as to avoid contact with the head of said locking pin.

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