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STEEL DETACHABLE ATTACHMENT LINK

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FiG. 1.

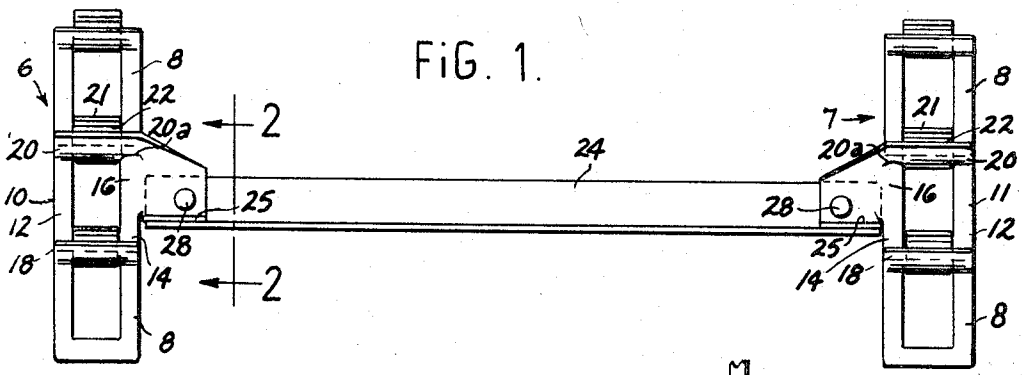
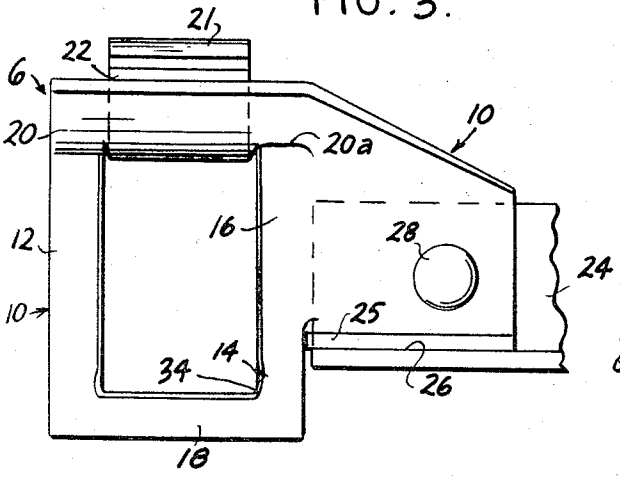


FiG. 3.



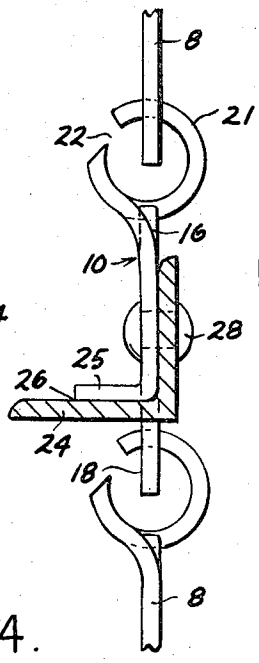


FiG. 2.

FiG. 4.

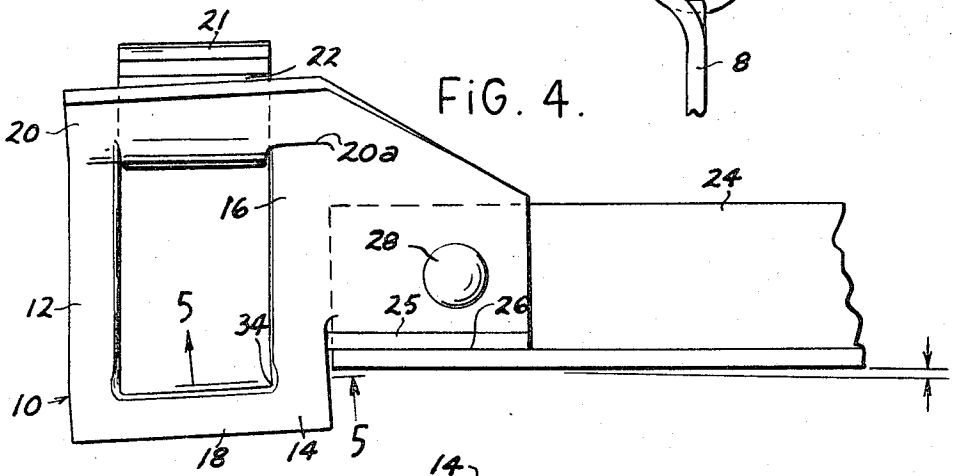
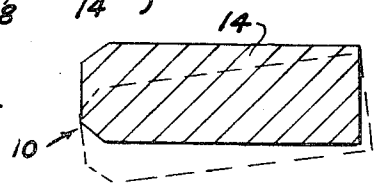


FiG. 5.



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STEEL DETACHABLE ATTACHMENT LINK

Nels E. Pearson, Evergreen Park, Ill., assignor to Rex Chainbelt Inc., Milwaukee, Wis., a corporation of Wisconsin

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This invention relates to steel detachable chain attachment links of the type which is provided with a sidewardly extending flange to which the end of a conveyor flight is attached. The flight comprises a relatively rigid member which is adapted to push bulk material along a defined path between parallel chains operating over spaced drive sprockets. Such chains generally carry a series of flights therebetween for such purposes and each pair of links to which the ends of each flight are secured includes a right hand and a left hand link having their flanges extending toward each other.

Steel detachable chain links of the type referred to are manufactured by scoring, stamping and forming flat strip steel stock at progressive stations of a punch press. The resulting, well-known product is a series of assembled links which, after suitable heat treatment, comprise the chain.

Each link is of rectangular outline and unitary construction. The material of the strip between the side members of each link remains attached to the rear curved cross member and is curled to form therewith the barrel which extends around the forward flat pintle member of the next adjacent link. A gap of limited width provided between the curved cross member and the curled part referred to allows the next adjacent link to be detached therefrom.

Excepting the barrel of the link, the larger dimensions of the link lie in the plane of the link and perforce the major stresses occur in that plane. However, as will be described, the attachment link is subject to additional stresses created by their connection to the conveyor flights.

The attachment links to which the present invention is directed are of similar form and manufacture except that they are discharged from the punch press as separate pieces and after heat treatment are inserted in such chain at selected intervals as required and as disclosed, for example, in my Patent No. 2,499,336.

The FIGURE 3 of said patent shows a typical attachment link D of the type provided with a sideward flange 62 to which one end of a conveyor flight is to be secured.

The attachment links of the present invention are of a slightly but significantly different configuration in that one side of each link includes the flange and a side member of some length and in particular the metal at the inside corner of the link defined by said side member and the pintle of the link is compressively stressed as by shot peening. According to the present invention, the effect of such length of said side member relative to the rigidity of the flight and such compressive stresses are sufficient to protect the inside corner of the link referred to against fatigue failures. That is, the effect referred to can be made to bring the service life of the attachment links up to that of the other links of the chain thereby providing maximum conveyor performance or capacity for a given investment in such chain.

The principal object of the present invention is to provide a new and improved stamped steel detachable chain attachment link which is strong, durable and which has an improved fatigue life to match that of the rest of the chain.

Another object of the present invention is to provide a stamped steel detachable chain link which can be easily

assembled and removed from a chain from either sideward direction.

The drawings furnished herewith illustrate the best mode of carrying out the invention as presently contemplated and set forth hereinafter.

In the drawings:

FIGURE 1 is a plan view of a portion of a flight conveyor showing the right and left hand steel detachable chain attachment links disposed in a pair of parallel, steel detachable chains and carrying a conveyor flight therebetween;

FIG. 2 is an enlarged section taken on line 2—2 of FIGURE 1;

FIG. 3 is an enlarged plan of the end of the flight and of the link shown in FIG. 2;

FIG. 4 is a view similar to FIG. 3 but showing an exaggerated deflection of the link and flight under the action of the working load; and

FIG. 5 is a further enlarged section taken on line 5—5 of FIG. 4 and the broken line indicates the twisting of the section which occurs when the link is bent under certain conditions.

Referring to FIGURE 1 of the drawings, the parallel chains 6 and 7 respectively comprise the links 8 and the right and left hand attachment links 10 and 11. Links 8 are identical and are of conventional construction such as already described. The links 10 and 11 are identical except that they are of right and left hand configuration, and for convenience only, the link 10 is shown and described in detail.

The link 10 includes first and second flat side bars 12 and 14 which are spaced to receive a sprocket tooth therebetween. The side bar 14 includes the sidewardly extending flange 16 for carrying one end of a conveyor flight. The forward ends of the side bars 12 and 14 are joined to and by the flat cross member 18 which is transverse of and integral with side bars 12 and 14 and which serves as the pintle. The cross member 20 is integral with the rearward end of the side bar 12 and with flange 16. The split 20*a* betwen cross member 20 and flange 16 is provided as required but should not affect the rigidity of the link.

The extension 21 remaining attached to cross member 20 is curled and the latter is also curved to define with member 20 a barrel in which the pintle of the next adjacent link is turnable. The transverse gap 22 between the ends of extension 21 and member 20 allow for assembly and disassembly of link 10 and such next adjacent link.

Links 10 and 11 are respectively disposed in lateral alignment and at spaced intervals in the parallel chains 6 and 7 of the flight conveyor to carry the flight 24 therebetween. Flight 24 operates to move bulk material along a defined path and it is essential to such operation that the ends of flight 24 be firmly and absolutely rigidly fixed to the respective links 10 and 11. If they are not so fixed, corrosion and wear will very quickly cause their riveted connections to fail. This is true of the links of the present invention as well as of prior art links.

The flange 16 is formed with forward portion 25 which is bent to extend perpendicularly of the plane of the link to provide a large forward surface 26 bearing against the flight. The end of the conveyor flight 24 is rigidly attached to the flange 16 by the rivet 28 so that the flange of the angle iron comprising the flight 24 is firmly held against the surface 26. The other end of the flight 24 is similarly connected to the link 11.

It has been mentioned that the material which forms extension 21 is that which is removed from between side members of the link which are bars 12 and 14 of link 10. Such removal is accomplished by deeply scoring both sides

of the strip material and then striking out the extension in the known manner which requires shearing of the material between the scoring.

Such shearing leaves jagged edges which, as is known, includes cracks or recesses where tensile stresses are more likely to cause fatigue failure.

In the attachment links of the prior art, such tensile stresses are greatest or such failure occurs most often at the inside forward corner of the link which is the corner **34** between side bar **14** and cross member **18** of link **10**. The high tensile stresses at such corner are due to two conditions which are peculiar to the conveyor service to which the chain is put.

As to the first condition, it should be understood that the chain tension applied to the pintle or cross member **18** of link **10** is greater than chain tension applied by the barrel to the next link due to and by the amount of resistance to movement of the material being conveyed by the flight attached to link **10** and if the link were allowed to pivot on rivet **28** it would do so under such conditions. Since the link cannot pivot, except to the extent that the flight will bend, cross member **18** and member **20** are, in effect, cantilevered and subject to deflection such that their ends which are joined by side bar **12** move forwardly relative to their other ends which are adjacent to the flight. Accordingly, and due to the necessary rigidity of the connection of the link to the flight, the link tends to be deformed in outline from a rectangle to a rhomboid having one obtuse angle at corner **34**. FIG. 4 shows link **10** in the form of such a rhomboid, but the extent of deformation is, of course, exaggerated.

FIG. 4 also shows that the flight **24** is slightly bent. This occurs generally depending upon the length and rigidity of the flight. Considering link **10** as relatively fixed to the flight, bending of flight **24** as shown tends to turn link **10** slightly counterclockwise as shown. It might seem that such bending should decrease the degree that the corner **34** tends to be opened or made more obtuse. However, because side bar **14** is of such length and limited width as shown and described, its juncture with the flange **16** also tends to be pulled to the right as shown by forces which thus also tend to open corner **34**.

As to the second condition, in the operation of the conveyor the flight **24**, with the other of such flights, may sometimes climb over rather than push the material to be conveyed. As a result, and again due to the necessary rigidity of the connection of the link to the flight, link **10** is subject to bending forces such that side bar **12** of the link is pulled downwardly out of the plane of the link and the upper and lower portions of corner **34** are respectively subject to tensile and compressive stresses. Such tensile stresses are, of course, additional to those just described.

According to the present invention, where side bar **14** is sufficiently long and is, generally, not appreciably wider than side bar **12**, the bending of the link tends to be induced to occur in the manner illustrated in FIGS. 4 and 5 and as will be described. The link **10**, as shown, prior to assembly in chain **8** and prior to attachment of flight **26**, has been shot peened in a known manner so that the indented surface is under a compressive stress, and particularly at corner **34** defined by cross member **18** and side bar **14**. Such shot peening is not feasible as to the links **8**, but is of benefit as to link **10** to the extent that link failures will be deferred sufficiently so that the chain is of a "balanced design."

Side bar **14** is of such length that the deformation of link **10** to a rhomboid due to the chain pull applied to flight **24** is modified to the extent that the side member **14** may turn slightly in the plane of the link with cross member **18** whereby the corner **34** would become less obtuse and, accordingly subjected to less tensile stress due to such chain pull.

In addition thereto, side bar **14** is of such length and limited width that it may twist slightly as illustrated in

FIG. 5 whereby the corner **34** would be less stressed by the forces which pull side bar **12** downwardly out of the plane of the link. It should be understood that the bending just described as shown in FIG. 4 does not actually or necessarily occur in practice because the chain tension is always considerably greater than the force applied to a given flight. An exception here might occur when the entire mass of material is frozen solid and temporarily immovable. In such event, chain failure would be due to forces exceeding the ultimate strength of the chain whereas the present invention provides an improvement in the fatigue resistance of the chain.

That is, while both the chain tension and the resistance of the material to movement is sustained, the tension is non-uniform or pulsates due to the type of the motive power and drive lines employed to turn the sprockets over which the chains operate.

The improvement in the attachment links of the present invention further provides the location of flight **24** with respect to the pintle or cross member **18** so that the flight does not prevent attachment and detachment of link **10** to and from the next preceding link **8** in either direction. In particular, the front face of flight **24** is sufficiently spaced rearwardly of the pintle or cross member **8** by at least a distance equal to the thickness of the metal of link **8** so that the cross member **14** can move through the gap of link **8**, which gap corresponds with gap **22** of link **10**. Attachment and detachment of link **8** in this direction is necessary because the parallel chains **6** and **7** operate between side walls, not shown, which are provided to retain the material to be conveyed. Such side walls prevent, detachment of link **8** in the other direction such that side member **12** of link **10** moves through the gaps of link **8**.

The present invention also requires no additional metal and is without cost except for the relatively inexpensive shot peening which is required.

Various modes of carrying out the invention are contemplated as being within the scope of the following claims particularly pointing out and distinctly claiming the subject matter which is regarded as the invention.

I claim:

1. In a chain attachment link of the type which is of integral stamped steel construction and rectangular form and includes an attachment plate which projects from one side of the link for securement to the end of a substantially rigid conveyor flight, a curled rear barrel, a flat forward pintle, and a side bar joining the corresponding ends of said pintle and barrel, the other end of said barrel being joined directly to said plate; a connecting bar extending parallel to said side bar and joining said other end of the pintle and said plate and being of a length and section so as to provide such relative flexibility therebetween which prevents the tensile stress in the inside corner of the link between said pintle and connecting bar from being materially increased when normal movement of the link is resisted by the flight and the force applied to the pintle tends to bend the link to a rhomboid form.

2. The invention of claim **1** further characterized by the formation of well rounded inside corners between said bars and pintle and by the compressively stressed surfaces of said pintle and said bars at and in the vicinity of said corners, the surfaces referred to being compressively stressed as by shot peening, said improvement particularly providing increased resistance of the link to fatigue failure.

3. The invention of claim **1** wherein the forward edge of said plate is provided with a flange having a forward portion extending generally perpendicularly upward of said link to provide a vertical surface for abutment with the conveyor flight, said forward portion being sufficiently displaced from the inner edge of said pintle to provide for unobstructed articulation of two adjacent links and assembly and disassembly of said link with similar links

of a conveyor chain from either sideward direction and without interference with the conveyor flight.

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EVON C. BLUNK, *Primary Examiner.*

M. L. AJEMAN, *Assistant Examiner.*