PUBLISHED
MAY 18, 1943.
BY A. P. C.

K. BENDER
COMPRESSION RESISTANT GROUP OF FLAT LINK CHAINS
Filed Sept. 29, 1941

Serial No.
412,905
2 Sheets-Sheet 1

Fig.1.

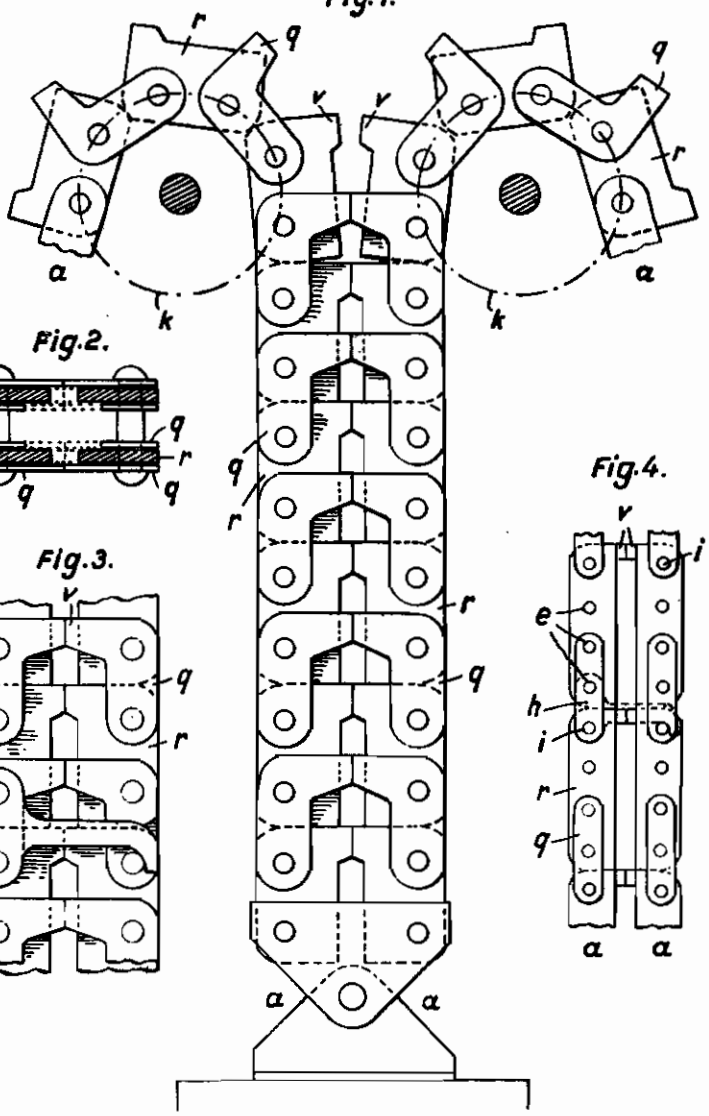

Fig.2.

Fig.3.

Fig.4.

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Fig. 5.

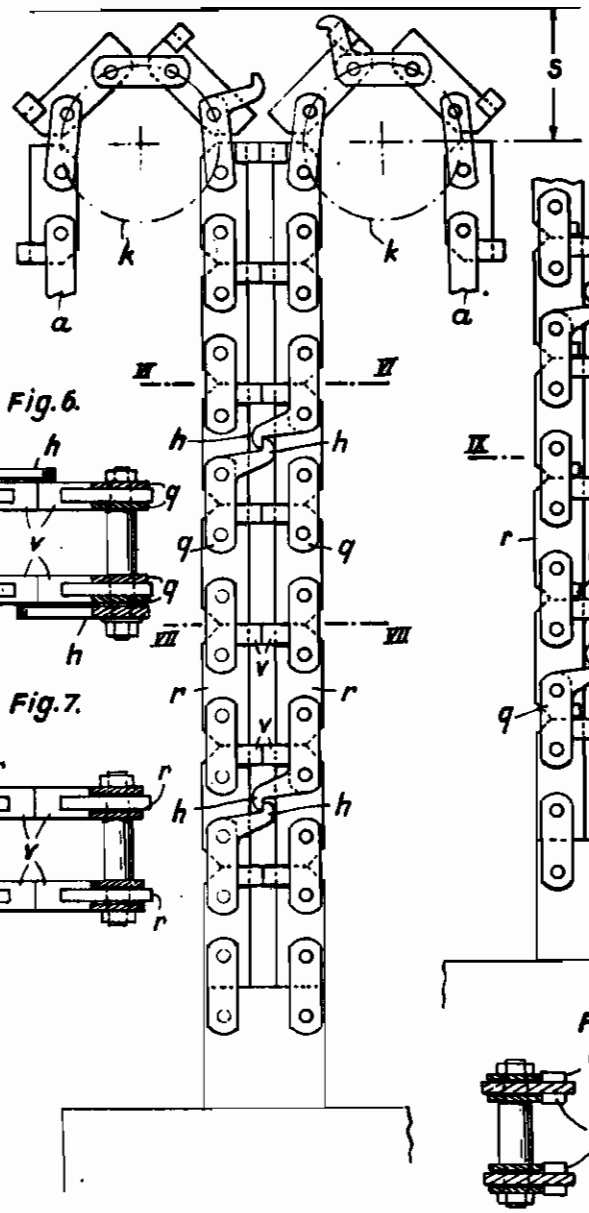
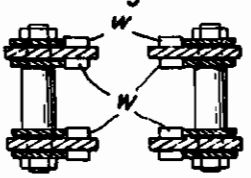


Fig. 6.

Fig. 7.

Fig. 8.

Fig. 9.



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ALIEN PROPERTY CUSTODIAN

COMPRESSION RESISTANT GROUP OF FLAT LINK CHAINS

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Application filed September 29, 1941

The present invention relates to a compression resistant group of flat link chains which is suitable in all cases in which loads are to be lifted and/or to be pressed downwardly. The invention particularly is adapted for use in connection with lifting gears of sluices, flood or lifting gates, mitred lock gates and the like.

The group of flat link chains consists of two oppositely acting flat link chains, adapted to be wound up in the same plane, whereby these two flat link chains mutually bear against each other for the purpose of forming a compression resistant group of flat link chains.

Each individual flat link chain consists of links pivotally connected to each other. The portions of the links located above the upper pivot pin are provided with nose-like projections facing the cooperating chain, and these projections are so arranged that the edges of the noses of the one chain bear against the edges of the noses provided on the cooperating chain so that in this manner a mutual support of the two chains is obtained.

Moreover, individual links of the flat link chains may be provided with hook-shaped members which serve the purpose of locking and act upon pivot pins of the counter or cooperating chain.

The arrangement may also be such that two hooks engaging each other are provided in staggered relation at the two flat link chains. These pairs of short locking hooks are provided in spaced relation from each other. With this construction, groups of flat link chains are provided which, even when provided with relatively short links, offer a very large resistance to compression.

Each individual link of each chain need not necessarily be provided with a nose-like projection, but in some cases a nose at each second or third link only is sufficient. In connection with flat link chains having an additional hook locking a still smaller number of noses may be sufficient.

If not each flat link of each chain is provided with noses, the links not having noses preferably are constructed as connecting links, as for instance as relatively short and small links, whereas the links carrying noses and connected to each other by the connecting links are relatively long and fitted with driving pins. The connecting links may then be connected to the upper link member by two driving pins so that, therefore, the connecting link cannot move with regard to the upper chain link.

The construction of the noses carried by the links of the flat link chains may be effected in various ways. So for instance the noses may be integral with webs rigidly connected to the chain links.

It may be of advantage to provide plates or the like to be shifted upon the upper portion of the chain link. In case of a chain consisting of links provided with connecting plates or the like, these noses preferably extend as far as to the connecting plates or links. By using such sifted on noses the webs of which, surrounding the centre links, extend as far as to the connecting links, the latter bear against the webs of the noses as soon as the chains occupy a stretched position and, therefore, said links cannot move further towards the centre of the two flat link chains. A mutual displacement of the individual centre flat links, therefore, is counter-acted.

Preferably at the lower ends of the centre links cams are additionally provided which are so constructed that the upper portions of the centre links bear against these cams as soon as the flat link chains occupy the stretched position. By this construction a mutual displacement of the centre links is absolutely prevented and, moreover, the advantage is ensured that after leaving the sprocket wheels, the flat link chains are positively brought into a perfect stretched position between the sprocket wheels and the object or member to be moved. Outward buckling of an individual flat link chain under compressive strain is possible towards one side only and this also in the case, that the front surfaces of the centre links are not bearing against each other, so that, therefore, an increase of the buckling strength is obtained.

In the accompanying drawings some modifications of groups of flat link chains constructed in accordance with the invention are shown by way of example.

In these drawings:

Fig. 1 is a side elevation of a group of flat link chains,

Fig. 2 is a cross section through the group of link chains according to Fig. 1,

Fig. 3 shows a side elevation of a modified construction of a group of flat link chains provided with locking hooks,

Fig. 4 is a side elevation of another modification provided with long chain links and connecting links,

Fig. 5 shows a side elevation of a group of flat link chains carrying pushed on noses and pairs of hooks,

Fig. 6 is a section on line VI—VI of Fig. 5,

Fig. 7 is a section on line VII—VII of Fig 5,

Fig. 8 is a side elevation of a group of flat link chains having additional cams, and

Fig. 9 is a section on line IX—IX through the group of flat link chains according to Fig. 8.

The two flat link chains *a* are so constructed as to oppositely act at compressive strain and to be unable to bend or flex in a direction away from each other.

As shown in Figs. 1–4, the ends of the chain links *r* and *q* located above the uppermost pivot pins are provided with nooses *v*. These nooses *v* project beyond the inner edges of the centre links *r* so far, that, after leaving the driving wheels *k*, they contact each other in the centre plane of the two flat link chains *a*, without any clamping actions being possible during movement of the flat link chains over the wheels *k*. The provision of the noose-like projections *v* at the chain links has the effect that the two flat link chains mutually support, so that a further intermediate member, for instance a special bearing chain, is not required.

If the flat link chains are loaded by compression they act in opposition to each other in such a manner as to be safe against bulging in any direction.

To increase the breaking strength of the chains at greater lengths, locking hooks *h* may be provided spaced in definite relation from each other.

The two flat link chains *a* are provided, as shown in Fig. 4, with elongated links and the centre links *r* are provided with riveted driving pins *e* and with a pivot pin *i*. The connecting links *q* are fixed to the centre links *r* by the driving pins *e* and extend for half the pitch of the chain beyond the lower end of the centre link *r* and engage the pivot pin *i* of the following centre link.

In this construction the upper portion of the centre links *r* located above the pivot point *i* only is provided with nooses *v*.

Instead of these nooses *v* flat iron webs of the same thickness and width may be welded to said portions which connect the two centre links of a flat link chain. The use of the flat iron webs *v* effects, that, on eventual displacements of the two flat link chains in the direction of the axis of the chain pins, a safe bearing of the individual oppositely arranged pairs of centre links against each other is ensured on compressive load of the chains. In connection with this construction also more particularly at larger breaking lengths of the chains locking hooks *h* may be provided spaced in definite distances from each other.

As shown in Figs. 5–7 the nooses *v* are shifted over the parts located above the upper pivot pin of the two members of the centre links *r* of both chains in such a manner that the two shanks of the nooses *v* extend over the centre links *r*. They may be riveted, screwed or welded to the centre links. The shanks of the nooses *v* extend over the centre links *r* as far as to the connecting links *q* so that, when the flat link chains are stretched, the links *q* bear against the shanks of the nooses *v*.

In definitely spaced distances from each other locking hooks *h* are provided. The latter may be fixed to one of the flat link chains and be so constructed that they engage with an elongated chain pin of the oppositely arranged chain as soon as the flat link chains are stretched.

However, to maintain the distance *s* from the centre of the driving wheel *k* to the outermost edge of the locking hook as small as possible during winding off of the chain from the driving wheel and consequently to utilize the space above the lifting gear as much as possible, preferably short locking hooks are provided at both flat link chains which, when the latter are stretched, engage each other and lock the chain against pressing apart from each other or bulging.

To prevent jamming occurring during locking and to ensure a locking free of objection, the hooks *h* are staggered about one chain link.

Besides the nooses serving bearing purposes and provided at the upper end of the centre links *r* and the locking hooks not designated and provided at the connecting links *q*, cams *w* may, as shown in Figs. 8 and 9, be provided at the centre links *r* of both flat link chains below the lower pivot pin. These cams *w* are fixed at one or both sides of the centre links, for instance by riveting, screwing or welding. The position of the cams and the shape of the latter must be so chosen that, when the flat link chains are stretched, one sides of the cams strongly bears against the inner side of the connecting links *q*. Preferably each link of the chains is provided with such a cam which, of course, may consist of several parts.

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