

Kettenförderer

Die Erfindung betrifft einen Kettenförderer gemäss dem Oberbegriff des Anspruchs 1.

Die hier zur Rede stehenden Kettenförderer werden im allgemeinen in Lagerfächern von Regallageranlagen eingesetzt, wo sie als Fördermittel für die einzulagernden Güter dienen. Das Fördermittel ist üblicherweise über zwei Umlenkungen zu einem Endlos-Fördermittel geschlaucht, wobei als eigentliches Fördermittel eine mit Rollen versehene Förderkette vorgesehen ist. Um Kosten und Gewicht zu sparen ist jedoch nicht das gesamte, umlaufende Fördermittel als Kette ausgebildet, sondern nur etwa die Hälfte, währenddem die andere Hälfte durch ein Gurtband gebildet wird.

Als Untersatz für die einzulagernden Güter kommen meist Paletten zum Einsatz. Beim Einlagern der Güter werden letztere auf die Förderkette gelegt und, meistens von einem Gabelstapler, in das Regal hineingeschoben. Bei Bedarf werden die Güter von diesem Gabelstapler auch wieder herausgezogen.

Aus der WO 94/00370 ist ein "Palettentragschiene zur Förderung von Paletten und Behältern" genannter, gattungsgemässer Kettenförderer bekannt. Dieser ist mit einer Rollenkette versehen, deren Tragrollen paarweise auf beiden Seiten durch ein Paar von Seitenlaschen verbunden sind, wobei jedes zweite Glied der Kette als Traglasche ausgebildet ist, auf welcher die einzulagernden Güter abgestützt werden können. Die Seitenlaschen stehen soweit nach unten vor, dass sie das obere Trum der Rollenkette seitlich entlang der Laufschiene führen können, wobei die Laufschiene dazu in ihrer Breite kleiner ist als der Abstand der beiden Seitenlaschen eines Paares. Im unteren Bereich weist die aus Aluminium gefertigte Laufschiene einen Rücklaufkanal auf, in welchem das untere Trum der Rollenkette aufgenommen, geführt und vertikal abgestützt ist.

Die Problematik bei dem geschilderten Kettenförderer besteht darin, dass die Seitenlaschen der Rollenkette sowohl Zug- wie auch Führungskräfte aufnehmen müssen. Dadurch können die Seitenlaschen nicht durchgehend aus einem Grundmaterial hergestellt werden, welches gute, selbstschmierende Eigenschaften wie beispielsweise PTFE aufweist, sondern sie müssen zumindest teilweise aus einem hochfesten Material, beispielsweise Stahl, gefertigt werden. Diese Ausbildung bringt den Nachteil mit sich, dass die Reibwerte zwischen Rollenkette und Führungsschiene relativ hoch sind. Dies trifft insbesondere auch für das untere, im Rücklaufkanal aufgenommene Kettentrum zu, da hier von den Seitenlaschen zusätzlich das Eigengewicht der Rollenkette aufgenommen werden muss. Durch die hohen, zwischen Rollenkette und Tragschiene entstehenden Reibwerte, wird die Baulänge eines solchermassen ausgestalteten Kettenförderers beschränkt. Zudem hat sich gezeigt, dass durch die Zugbelastung auf den gleichzeitig als Führungsmitteln ausgebildeten Seitenlaschen die Reibungswiderstände zusätzlich erhöht werden.

Eine weitere Problematik des vorgängig geschilderten Kettenförderers besteht darin, dass die verwendeten Ketten nur Zugkräfte aufnehmen können. Sobald Schubkräfte auf die Kette einwirken, was beim Einlagern von Gütern immer der Fall ist, besteht die Gefahr, dass sich die Kette zusammenfaltet indem sich einzelne, auf Schub beanspruchte Kettenglieder gegeneinander verdrehen.

Insbesondere derjenige Kettenabschnitt, der sich zwischen der beim Einschieben befindlichen Palette und den bereits eingelagerten Gütern befindet, wird in hohem Masse auf Schub beansprucht. Die sich beim Einschieben befindliche Palette übt eine Zugkraft auf den hinter ihr befindlichen Kettenabschnitt aus, der um die vordere Umlenkung geführt wird. Da solche Umlenkungen jedoch aus Platzgründen einen sehr geringen Durchmesser aufweisen, haben diese einen schlechten Wirkungsgrad und eignen sich nicht für hohe Zugkräfte. Der um die Umlenkung umgelenkte Kettenzug wird über das elastische Gurtband an die hintere Um-

lenkung übertragen, die den Wirkungsgrad weiter verschlechtert, wobei zu berücksichtigen ist, dass die Masse der eingelagerten Güter bis zu 20 Tonnen betragen kann.

Es versteht sich, dass unter den geschilderten Umständen ein Zusammenfallen der Kette unerwünscht ist, da sich durch dieses Zusammenfallen die Gesamtlänge der Kette schlagartig verändert, was im Extremfall zum Reißen des Gurtbandes und zur Zerstörung der Umlenkungen führen kann. Ausserdem kann durch ein Zusammenfallen der Kette ein zum Schutz der eingelagerten Gütern allenfalls genau einzuhaltender Abstand verändert werden. Auch kann es passieren, dass, insbesondere leichte Güter, in demjenigen Bereich, in dem die Kette zusammengefallen wird, angehoben und aus der horizontalen Lage verdreht werden.

Dieses Zusammenfallen ist bei herkömmlichen Ketten nicht zu vermeiden, da sich die Gesamtlänge der Ketten bzw. des umlaufenden Fördermittels, beispielsweise durch Temperaturänderungen oder durch Dehnung des Gurtbandes, relativ stark verändern kann.

Es ist somit die Aufgabe der Erfindung, einen Kettenförderer der im Oberbegriff des Anspruchs 1 beschriebenen Art derart zu verbessern, dass die Kette auch Schubkräfte aufnehmen und übertragen kann.

Diese Aufgabe wird durch die im Kennzeichen des Anspruchs 1 aufgeführten Merkmale gelöst.

Durch das Vorsehen von Laschen, welche über Anschläge verfügen, die die gegenseitige, über einen vorbestimmten Winkel hinausgehende Drehbewegung benachbarter Laschen derart begrenzen, dass die Rollenkette Schubkräfte übertragen kann, wird die Gefahr des Zusammenfaltens einzelner Abschnitte der Kette gebannt und die damit verbundenen Nachteile vermieden.

Bevorzugte Ausführungsformen der Erfindung sind in den abhängigen Ansprüchen 2 bis 10 umschrieben.

Eine weitere Aufgabe der Erfindung besteht darin, einen Kettenförderer vorzuschlagen, der mit Mitteln zum seitlichen Führen der Rollenkette ausgebildet ist, welche einfach angeordnet und kostengünstig gefertigt werden können, wobei die Führungsmittel mit sehr geringen Reibungswiderständen zwischen Rollenkette und Tragschiene aufwarten sollen.

Diese Aufgabe wird durch die im Kennzeichen des Anspruchs 11 aufgeführten Merkmale gelöst.

Die Erfindung wird nachfolgend anhand von Zeichnungen näher erläutert. In diesen Zeichnungen zeigt/zeigen:

Fig. 1 bis 3 eine einzelne Lasche für eine Rollenkette in drei unterschiedlichen Ansichten;

Fig. 4 bis 6 ein Führungselement für die Rollenkette in drei unterschiedlichen Ansichten;

Fig. 7 bis 9 einen Mitnehmer für die Rollenkette in drei unterschiedlichen Ansichten;

Fig. 10 einen Querschnitt durch eine Tragschiene sowie durch die Rollenkette.

Fig. 11 eine Draufsicht auf einen Abschnitt einer Rollenkette, welche mit Laschen gemäss den Fig. 1 bis 3 versehen ist;

Fig. 12 den Abschnitt der Rollenkette gemäss Fig. 11 in einer Seitenansicht;

Die Fig. 1 bis 3 zeigen eine Lasche 1 für eine Rollenkette in einem Aufriss, einem Seitenriss und einem Grundriss. Die Lasche

1 ist im wesentlichen U-förmig ausgebildet und weist einen Basisteil 10 sowie zwei Schenkel 11, 12 auf. Der zwischen den beiden Schenkeln 11, 12 liegende Basisteil 10 bildet die obere Abdeckung der Lasche 1. Beide Schenkel 11, 12 der Lasche 1 sind mit Bohrungen 13 versehen, welche der Aufnahme von je einer Welle zur Verbindung der Laschen 1 sowie zur Lagerung und Abstützung von Tragrollen dienen.

Der Basisteil 10 der Lasche 1 ist mit zwei entlang des einen Schenkels 11 angeordneten Aussparungen 16 versehen, deren Breite b_2 grösser als die Wandstärke eines Schenkels 11, 12 ist. Durch diese Aussparungen 16 wird das Zusammenfügen von mehreren, einheitlich ausgebildeten Laschen 1 zu einer Kette begünstigt, indem ein Schenkel 11, 12 einer vorhergehenden oder nachfolgenden, um jeweils 180° um die Hochachse verdrehten, Lasche 1 in eine solche Aussparung 16 eingreift.

Der Basisteil 10 ist zudem mit einem quer zu dessen Längsachse verlaufenden Schlitz 15 versehen. Dieser Schlitz 15 dient der Aufnahme eines aus einem elastischen Material gefertigten Mitnehmers, wie nachfolgend anhand der Fig. 7 bis 9 noch näher erläutert wird.

Die Grundform einer solchen Lasche 1 wird vorzugsweise durch Stanzen hergestellt, währenddem die U-förmige Gestaltung durch anschliessendes Biegen des ausgestanzten Teils erzeugt wird.

Die beiden Endbereiche 17, 18 des Basisteils 10 einer Lasche 1 sind vorzugsweise schräg ausgebildet. Andererseits können die beiden Endbereiche des Basisteils auch mit einer Stufung versehen sein, wie dies durch unterbrochen eingezeichnete Linien L angedeutet ist.

Der eine Schenkel 12 ist mit zwei die Oberseite des Basisteils 10 überragenden Erhebungen 14 versehen, wobei aus fertigungstechnischen Gründen jeweils der dem kürzeren Bereich 17a, 18a

des Basisteils 10 angrenzende Schenkel 12 solche Erhebungen 14 aufweist.

In den Fig. 4 bis 6 ist ein Führungselement 2 für die Rollenkette in drei unterschiedlichen Ansichten dargestellt. Dieses Führungselement 2 besteht im wesentlichen aus einer Führungsplatte 21 sowie einem Klemmteil 24. Auf der Innenseite der Führungsplatte 21 ist eine Leiste 23 angeformt. Der untere Bereich 26 der Führungsplatte 21 dient der seitlichen Führung der Rollenkette währenddem die Führungsplatte 21 auf der Oberseite eine Auflagefläche 25 aufweist, welche bei einer umlaufenden Kette zum Abstützen des unteren Kettentrums ausgebildet ist. Die Funktionsweise dieser Führungsplatte 21 wird nachfolgend anhand der Fig. 10 noch näher erläutert.

Die Fig. 7 bis 9 zeigen den Mitnehmer 19 in einem Aufriss, einem Seitenriss sowie einem Grundriss. Der vorzugsweise aus Gummi gefertigte Mitnehmer 19 dient als Auflage für auf den Laschen abzustützende Güter. Zum Fixieren in dem im Basisteil der Lasche eingelassenen Schlitz weist der Mitnehmer 19 einen Halteteil 15 auf, der korrespondierend zu diesem Schlitz ausgebildet ist. Zum Fixieren wird der Halteteil 15 durch den Schlitz geführt und der Mitnehmer danach um 90° verdreht. Der Mitnehmer 19 überragt die Erhebungen der Lasche vorzugsweise geringfügig, so dass leichte Güter nicht auf den Erhebungen sondern auf dem Mitnehmer aufliegen. Durch die elastische Ausbildung des Mitnehmers 19 wird jedoch sichergestellt, dass schwere Güter den Mitnehmer zusammenstauchen und dadurch auf den Erhebungen aufstehen, wodurch eine sichere, kraftschlüssige Verbindung zwischen Lasche und einzulagernden Gütern -Palette- sichergestellt ist.

Die Fig. 10 zeigt einen Querschnitt durch eine Tragschiene 5 sowie eine Rollenkette 8. Die Tragschiene 5 weist auf der Oberseite eine nach oben abgesetzte Lauffläche 6 auf, welche seitlich von zwei Führungsflächen begrenzt wird. Auf der Unterseite ist die Tragschiene 5 mit einem nach unten offenen Hohlraum H

ERSATZBLATT (REGEL 26)

ISA/EP

versehen, in dem zwei Hilfsschienen 7 angeordnet sind, auf welchen die Führungsplatten 21 der Führungselemente 2 mit ihren Auflageflächen 25 aufliegen und das untere Kettentrum 8b vertikal abstützen.

Die Rollenkette 8 wird durch eine Vielzahl gemäss den Fig. 1 bis 3 ausgebildete Laschen 1 sowie Tragrollen 3 gebildet, wobei jeweils zwei Laschen mittels einer Welle 28 gelenkig miteinander verbunden sind. Die Wellen 28 dienen gleichzeitig auch der Lagerung der Tragrollen 3. Durch die jeweilige Welle 28 ist ein Führungselement 2 hindurchgeführt, welches die Lasche 1 auf der einen Seite nach unten überragt. Auf der anderen Seite hintergreift der Klemmteil 24 des Führungselements 2 den Schenkel 12a, wodurch sowohl die Welle 28 wie auch das Führungselement 2 in der hier dargestellten Position fixiert werden. Zur Sicherung des Führungselements 2 kann zudem, wie dargestellt, ein Sicherungsbolzen 29 vorgesehen werden, der selbsthemmend verankert ist. Um aus den einheitlichen Laschen 1 eine Kette zu bilden, sind diese wechselweise um 180° um ihre Hochachse verdreht angeordnet, wobei die eine gegenüber der anderen Lasche, in Längsrichtung der Rollenkette gesehen, um jeweils die Wandstärke eines Schenkels einer Lasche versetzt ist. Nebst den Laschen 1 sind auch die Führungselemente 2 wechselweise um 180° verdreht angeordnet, d.h. mit anderen Worten, die Führungselemente 2 werden wechselweise einmal von links und einmal von rechts durch die jeweilige Welle 28 hindurchgeschoben, so dass die Rollenkette 8 auf beiden Seiten der Lauffläche 6 geführt wird. Die Leiste 23 des Führungselements 2 erstreckt sich entlang der Unterseite des jeweiligen Schenkels einer Lasche, und verhindert ein Verdrehen des Führungselements 2, wobei die Höhe der Leiste 23 in etwa der Wandstärke eines Schenkels einer Lasche entspricht. Anzufügen ist, dass die Rollenkette 8 nur ca. 60% des umlaufenden Fördermittels bildet, währenddem die restlichen 40% aus einem Gurtband bestehen, das an den beiden Kettenenden fixiert ist.

ERSATZBLATT (REGEL 26)

ISA/EP

Fig. 11 zeigt eine Draufsicht auf einen Abschnitt einer Rollenkette, welche mit einheitlichen Laschen 1 gemäss den Fig. 1 bis 3 sowie Führungselementen 2 gemäss den Fig. 4 bis 6 versehen ist. Aus dieser Darstellung ist ersichtlich, dass die Laschen 1a, 1b, 1c, 1d wechselweise um 180° um ihre Hochachse verdreht angeordnet sind, und dass die eine gegenüber der anderen Lasche 1a, 1b, 1c, 1d, in Längsrichtung der Rollenkette 8 gesehen, um jeweils die Wandstärke eines Schenkels einer Lasche 1a, 1b, 1c, 1d versetzt ist, so dass jeweils der eine Schenkel 11, 12 einer Lasche in die Ausnehmung 16 (Fig. 3) im Basisteil der benachbarten Lasche eingreift. Diese Ausbildung erlaubt, dass die Laschen 1a, 1b, 1c, 1d, auch Seitenkräfte aufnehmen und übertragen können.

Im weiteren ist ersichtlich, dass die mittlere Länge L des Basisteils 10 zumindest annähernd dem Achsabstand A zwischen zwei benachbarten Tragrollen 3 entspricht. Der Basisteil 10 ist vorzugsweise um ca. 0.5 bis 3 mm kürzer als der Achsabstand zwischen zwei benachbarten Tragrollen 3, so dass im gestreckten Zustand der Kette zwischen den Stirnseiten benachbarter Basisteile 10b, 10c von benachbarten Laschen 1b, 1c ebenfalls ein Spalt b in der Grössenordnung von 0.5 bis 3 mm entsteht. Diese Ausbildung bewirkt, dass die gegenseitige, über einen vorbestimmten Winkel hinausgehende Drehbewegung benachbarter Laschen begrenzt wird, indem sich beim gegenseitigen Zurückdrehen der Laschen die Stirnseiten benachbarter Basisteile aneinander anlegen. Wichtig in diesem Zusammenhang ist, dass die Stirnseiten benachbarter Basisteile von benachbarten Laschen korrespondierend ausgebildet sind. Eine derartige ausgebildete Rollenkette kann somit Schubkräfte übertragen, ohne dass die Gefahr besteht, dass sich die Kette auf einzelnen Abschnitten zusammenfaltet.

Fig. 12 zeigt den Abschnitt der Rollenkette gemäss Fig. 11 in einer Seitenansicht. Aus dieser Darstellung sind die wechselweise angeordneten Führungselemente 2 ersichtlich, welche die Laschen nach unten überragen.

ERSATZBLATT (REGEL 26)

ISA/EP

Ein derartig ausgestalteter Kettenförderer ist sehr einfach aufgebaut und kann preisgünstig hergestellt werden, da sowohl die Laschen wie auch die Führungselemente einheitlich ausgebildet sind. Durch das Vorsehen von Anschlägen, welche die gegenseitige, über einen vorbestimmten Winkel hinausgehende Drehbewegung benachbarter Laschen in der vorgängig beschriebenen Weise begrenzen, kann die Rollenkette auch Schubkräfte übertragen.

Patentansprüche

1. Kettenförderer mit einer Rollenkette (8) und einer Tragschiene (5) zum vertikalen Abstützen der Rollenkette (8), wobei die Rollenkette (8) eine Vielzahl von Tragrollen (3) aufweist, welche mittels Laschen (1) miteinander verbunden sind, dadurch gekennzeichnet, dass die Laschen (1) Anschläge aufweisen, welche die gegenseitige, über einen vorbestimmten Winkel hinausgehende Drehbewegung benachbarter Laschen (1) derart begrenzen, dass die Rollenkette (8) Schubkräfte übertragen kann.
2. Kettenförderer nach Anspruch 1, dadurch gekennzeichnet, dass der überwiegende Teil der Laschen (1) U-förmig ausgebildet ist, indem diese zwei Schenkel (11, 12) und einen dazwischen liegenden Basisteil (10) aufweisen, dass die mittlere Länge (L) des Basisteils (10) zumindest annähernd dem Achsabstand (A) von zwei benachbarten Tragrollen (3) entspricht, und dass die Stirnseiten (17, 18) benachbarter Basisteile (10) von benachbarten Laschen (1) korrespondierend ausgebildet sind und als Anschläge wirken.
3. Kettenförderer nach Anspruch 2, dadurch gekennzeichnet, dass im gestreckten Zustand der Rollenkette (8), zwischen den Stirnseiten benachbarter Laschen, ein Spalt (b) von weniger als 5% der Länge einer Lasche (1) besteht.
4. Kettenförderer nach Anspruch 2 oder 3, dadurch gekennzeichnet, dass der Basisteil (10) der Laschen (1) als obere Abdeckung der Rollenkette (8) ausgebildet ist und im gestreckten Zustand der Rollenkette (8) sowohl die Tragrollen (4) wie auch die Tragschiene (5) vor Verschmutzung schützen.
5. Kettenförderer nach einem der Ansprüche 2 bis 4, dadurch gekennzeichnet, dass die beiden Endbereiche (17, 18) des Basisteils (10) einer Lasche (1) eine Stufung aufweisen und/oder schräg ausgebildet sind.



6. Kettenförderer nach Anspruch 5, dadurch gekennzeichnet, dass die Laschen (1) einstückig ausgebildet sind, und dass der dem kürzeren Bereich (17a, 18a) des Basisteils (10) angrenzende Schenkel (12) mit einer die Oberseite des Basisteils (10) überragenden Erhebung (14) versehen ist.

7. Kettenförderer nach einem der Ansprüche 2 bis 6, dadurch gekennzeichnet, dass der Basisteil (10) der Laschen (1) auf der Oberseite als Auflagefläche für auf der Rollenkette (8) zu fördernde Güter ausgebildet ist.

8. Kettenförderer nach einem der Ansprüche 2 bis 7, dadurch gekennzeichnet, dass der Basisteil (10) mit zwei entlang eines Schenkels (11, 12) angeordneten Aussparungen (16) versehen ist, deren Breite (b) grösser als die Wandstärke eines Schenkels (11, 12) ist.

9. Kettenförderer nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, dass die Rollenkette (8) aus einheitlichen Laschen (1) besteht, welche eine von einer zentralsymmetrischen Gestaltung abweichende Geometrie aufweisen, und dass die Laschen (1a, 1b, 1c, 1d) wechselweise um 180° um ihre Hochachse verdreht angeordnet sind, wobei die eine gegenüber der anderen Lasche (1a, 1b, 1c, 1d), in Längsrichtung der Rollenkette (8) gesehen, um jeweils die Wandstärke eines Schenkels (11, 12) einer Lasche (1) versetzt ist.

10. Kettenförderer nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, dass der Basisteil (10) mit einem quer zur Bewegungsrichtung der Rollenkette (8) verlaufenden Schlitz (15) versehen ist, und dass ein aus einem elastischen Material gefertigter Mitnehmer (19) vorgesehen ist, welcher mit einem korrespondierend zu diesem Schlitz ausgebildeten Halteteil (20) versehen ist, der durch den Schlitz (15) führbar und durch eine anschliessende Drehung um 90° im Basisteil (10) fixierbar ist.



11. Kettenförderer nach Anspruch 1, wobei die Laschen (1) der Rollenkette (8) mittels einer Welle (28) gelenkig miteinander verbunden sind, und wobei die Welle (28) gleichzeitig als Tragachse für die Tragrollen (3) ausgebildet ist, dadurch gekennzeichnet, dass die Welle (28) hohl ist, und dass durch die Welle (28) ein diskret ausgebildetes Führungselement (2) hindurchgeführt ist, welches die Lasche (10) zumindest auf einer Seite nach unten zur Führungsschiene (5) hin überragt.

12. Kettenförderer nach Anspruch 11, dadurch gekennzeichnet, dass das Führungselement (2) mit einer zur Lasche (10) zu richtenden Leiste (23) versehen ist, welche sich entlang der Unterseite des Schenkels einer Lasche (10) erstreckt, wobei die Höhe der Leiste (23) maximal der Wandstärke eines Schenkels (11, 12) einer Lasche (10) entspricht.

13. Kettenförderer nach Anspruch 11 oder 12, dadurch gekennzeichnet, dass die Tragschiene (5) auf der Oberseite eine Lauffläche (6) aufweist, welche seitlich von zwei tiefer liegenden Führungsflächen (31, 32) begrenzt wird, und dass jedes Führungselement (2) zumindest ein seitliches Führungsglied (21) aufweist, welches mit den Führungsflächen (31, 32) zusammenzuarbeiten bestimmt ist.

14. Kettenförderer nach einem der Ansprüche 11 bis 13, dadurch gekennzeichnet, dass die Führungselemente (2) aus einem Kunststoff gefertigt sind, welcher gute, selbstschmierende Eigenschaften aufweist.

15. Kettenförderer nach einem der Ansprüche 11 bis 14, mit endseitig angeordneten Umlenkvorrichtungen zum Umlenken der Rollenkette (8) und zur Unterteilung derselben in ein oberes und ein unteres Kettentrum (8a, 8b), wobei die Tragschiene (5) auf ihrer Unterseite einen das untere Kettentrum (8b) zumindest teilweise aufnehmenden Hohlraum (H) aufweist, dadurch gekennzeichnet, dass die Führungselemente (2) die Laschen (1) des oberen Kettentrums (8a) sowohl nach unten zur Führungsschiene



(5) hin wie auch zumindest auf einer Seite überragen, wobei der die Laschen (1) nach unten überragende Bereich (26) der Führungselemente (2) zur Führung des oberen Kettentrums (8a) ausgebildet ist, und wobei das Führungselement (2) in dem die Laschen (1) seitlich überragenden Bereich eine Führungsfläche (25) zur Führung und vertikalen Abstützung des unteren, zumindest teilweise im Hohlraum (H) aufgenommenen Kettentrums (8b) aufweist.

16. Kettenförderer nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, dass beide Enden der Rollenkette (8) mittels eines Gurtbandes zu einem umlaufenden, endlosen Fördermittel verbunden sind, wobei die Länge der Rollenkette (8) höchstens 60% des gesamten Fördermittels beträgt.

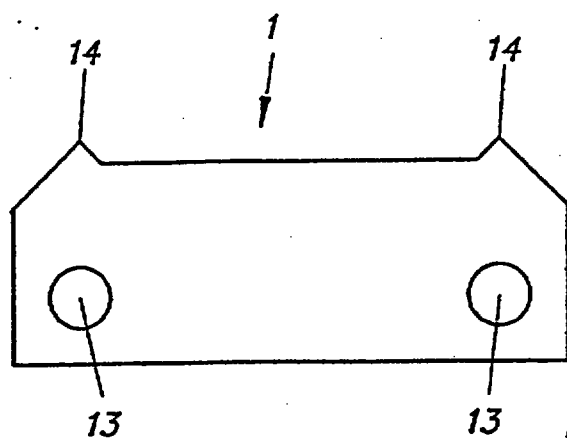


Fig. 1

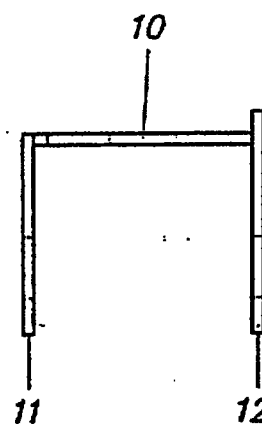


Fig. 2

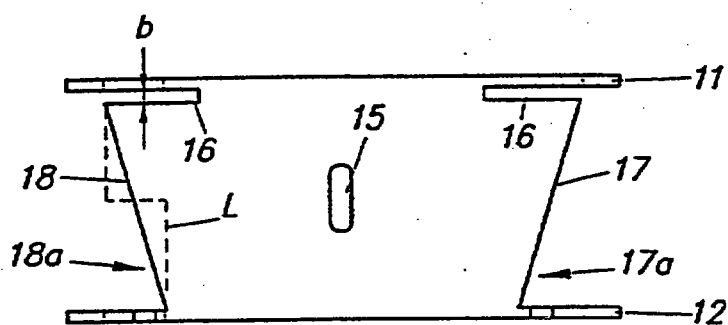


Fig. 3

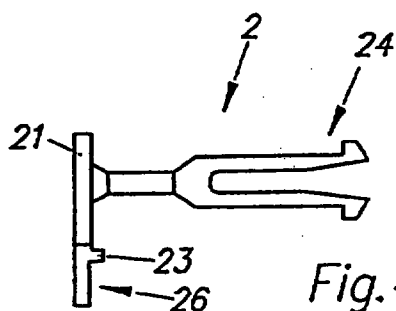


Fig. 4



Fig. 5

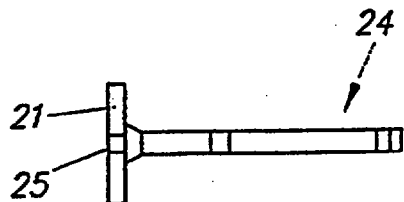


Fig. 6

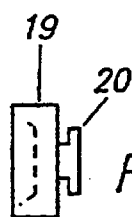


Fig. 7

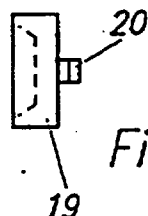


Fig. 9



Fig. 8

2/3

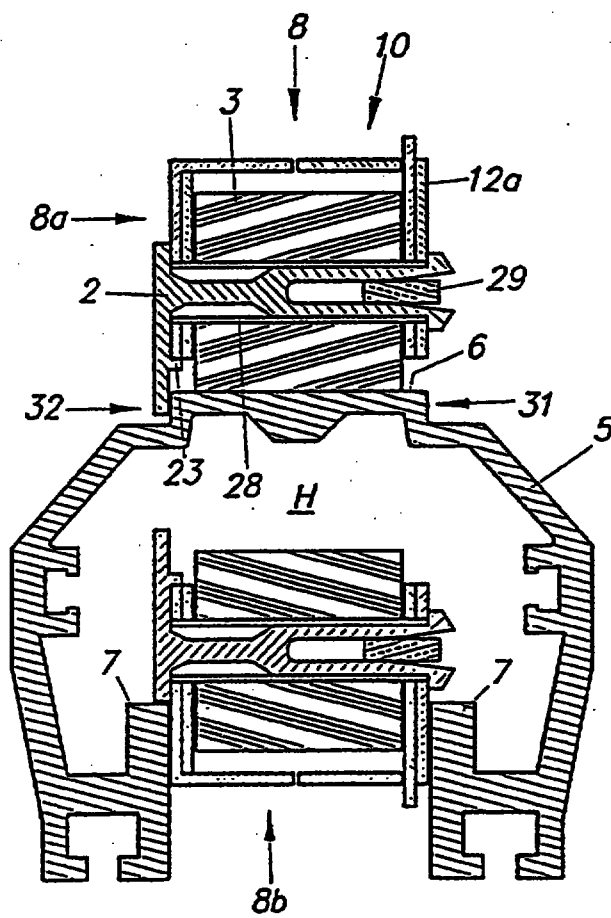


Fig. 10

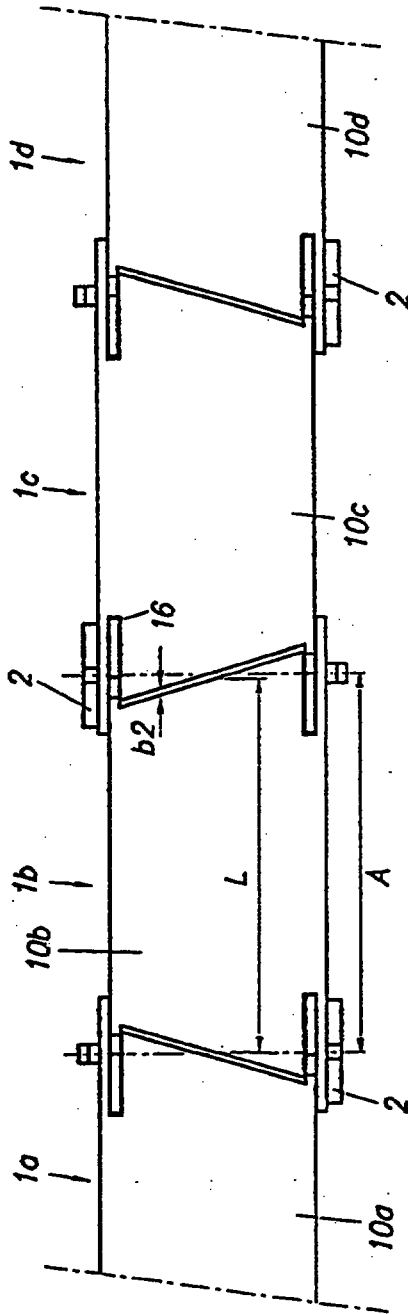


Fig. 11

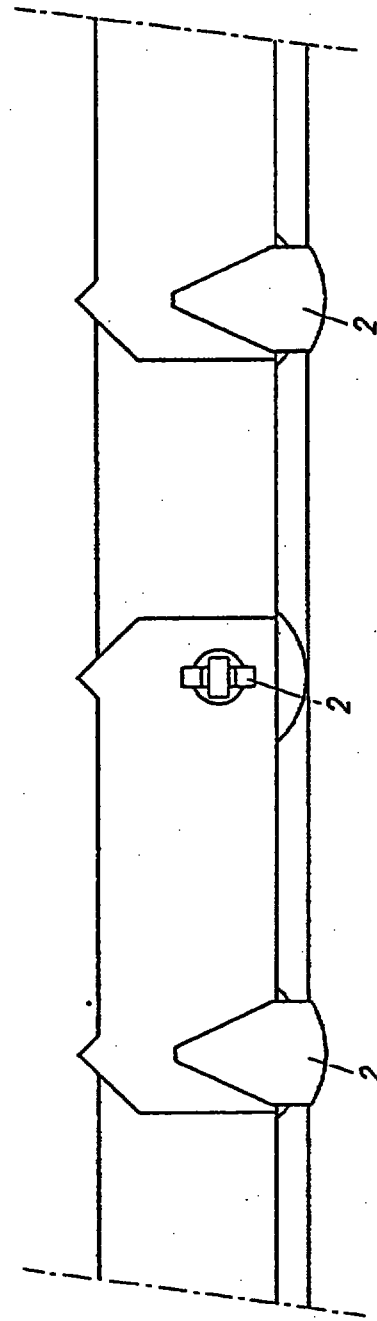


Fig. 12

Chain Conveyor

The invention refers to a chain conveyor according to the preamble of claim 1.

The chain conveyors discussed herein are used in general in storage shelves of rack storage facilities where they serve as a conveying means for the goods to be stored. The conveying means is usually looped over two deflections to form an endless conveying means, whereby there is provided, as the real conveying means, a conveyor chain provided with rollers. In order to save costs and weight, however, not the entire circulating conveying means is constituted as chain, but only about half of it, while the other half is constituted by a strap.

As a support for the goods to be stored, in most cases pallets are used. Upon storing the goods, the latter ones are laid onto the conveyor chain and, mostly by means of a fork lift truck, pushed into the storage rack. If the need arises, the goods are pulled out again by this fork lift truck.

The document WO 94/00370 entitled "Pallet-Support Rail and Slide-in Pallet-Storage Unit with Pallet-Support Rails and Pallet-Conveyor Track" discloses a chain conveyor of the generic concept discussed herein. This conveyor is provided with a roller chain, the supporting rollers thereof being connected to each other on both sides by means of a pair of lateral link plates, whereby each second link of the chain is designed as supporting strap member. The lateral link plates project downwards to such an extent that they can laterally guide the upper run of the roller chain along the rail, whereby, for this purpose, the rail is smaller in its width than the mutual distance of the two link plates of a pair. In its lower portion, the rail made of aluminum comprises a return channel in which the lower run of the roller chain is received, guided and supported.

The problems in connection with the chain conveyor discussed above consist in that the lateral link plates of the roller chain have to take both tractive forces as well as guiding forces. Thus, the lateral link plates cannot be made continuously of a material which has good self-lubricating properties, like PTFE, but they have to be manufactured, at least partially, of a high-strength material, for example steel. This design results in the disadvantage that the frictional values between roller chain and guiding rail are relatively high. This is also particularly true for the lower chain run received in the return channel because here additionally the intrinsic weight of the roller chain has to be supported by the lateral link plates. Due to the high frictional values arising between roller chain and supporting rail, the constructional length of a chain conveyor with such a design is limited. Moreover, it has shown that the frictional resistance is additionally increased by the tractive load of the lateral link plates simultaneously designed as guiding means.

Further problems in connection with a chain conveyor as discussed herein before consist in the fact that the chains used hereby can take only tractive forces. As soon as thrust forces act on the chain, what is always the case upon loading of goods, the danger exists that the chain folds by the mutual rotation of particular chain links that are subjected to thrust forces.

Particularly that chain portion which is situated between the pallet to be pushed in and the goods already stored is subjected to thrust forces to a high extent. The pallet to be pushed in exerts a tractive force onto the chain portion situated behind that pallet and guided around the front deflection. Since such deflections have a very small diameter due to the limited available space, they have a bad efficiency and are not suited for high tractive forces. The tractive force in the chain deflected around the deflection is transmitted via the elastic strap to the rear deflection which further decreases the efficiency, whereby it is to be considered that the mass of the stored goods can amount up to 20 tons.

It is understood that a folding of the chain is most undesirable under the explained circumstances because the total length of the chain is suddenly changed by this folding; in an extreme case, this can result in a rupture of the strap and in a damage of the deflections. Moreover, by a folding of the chain, a distance between the goods, that possibly has to be observed for the protection of the stored goods, can be changed. Also, it can happen that particularly light weight goods are raised and rotated out of the horizontal position upon a folding of the chain.

A folding cannot be avoided when conventional chains are used because the total length of the chains and the circulating conveying means, respectively, can vary to a large extent due to for instance temperature changes and expansion of the strap.

Thus, it is the object of the invention to improve a chain conveyor of the kind referred to in the preamble of claim 1 such that the chain can also take and transmit thrust forces.

This object is met by the characteristics listed in the characterizing portion of claim 1.

By providing chain links which have stop elements that limit a mutual rotation of adjacent chain links exceeding a certain angle of rotation in such a way that the roller chain can transmit thrust forces, the danger that particular portions of the chain are folded together is kept off and the disadvantages connected thereto are avoided.

Preferred embodiments of the invention are described in the dependent claims 2 to 10.

A further object of the invention consists in to provide a chain conveyor that is designed with means for laterally guiding the roller chain, which are simply arranged and can be manufactured at low costs, whereby the guide means shall present very low frictional resistances between roller chain and support rail.

This object is met by the characteristics listed in the characterizing portion of claim 11.

In the following, the invention will be further explained, with the help of drawings. In these drawings,

Fig. 1 shows an individual chain link for a roller chain in three different views;

Fig. 2 shows a guiding element for the roller chain in three different views;

Fig. 3 shows a cross section through a support rail as well as through the roller chain;

Fig. 4 shows a top view of a portion of a roller chain equipped with chain links according to Fig. 1;

Fig. 5 shows a portion of the roller chain according to Fig. 4 in a side view.

The Fig. 1 show a chain link 1 for a roller chain in a side elevation, a front elevation and a top elevation. The chain link 1 is designed essentially U-shaped and comprises a base portion 10 as well as two legs 11, 12. The base portion situated between the two legs 11, 12 constitutes the top cover of the chain link 1. Both legs 11, 12 of the chain link 1 are provided with bores 13 which serve for receiving in each case a shaft for interconnecting the chain links 1 and for bearing and supporting a support roller.

The base portion 10 of the chain link 1 is provided with two recesses 16 arranged along one of the legs 11 and having a width b_2 that is greater than the wall thickness of a leg 11, 12. By providing these recesses 16, the assembling of several uniformly designed chain links 1 to a chain is favored inasmuch as one leg 11, 12 of a preceding or subsequent chain link 1, in each case rotated by 180° around the height axis, engages such a recess 16.

THIS SHEET HAS BEEN
REPLACED

This Sheet Has Been Replaced





Moreover, the base portion 10 is provided with a slot 15 running crosswise to its longitudinal axis. This slot serves for receiving a catch member made of an elastic material, as will be further explained herein below with the help of Fig. 2a.

The basic shape of such a chain link 1 is manufactured preferably by punching, while the U-shaped design is created by a subsequent bending of the punched out part.

The two end portions 17, 18 of the base portion 10 of a chain link 1 are preferably of oblique shape. On the other hand, the two end portions of the base portion can be provided with a stepping, as outlined by the broken lines L.

The one leg 12 is provided with two projections 14 towering above the top side of the base portion 10, whereby, due to manufacturing reasons, in each case the leg 12 adjacent to the shorter portion 17a, 18a of the base portion 10 comprises such projections 14.

In the Fig. 2, a guiding element 2 for the roller chain is shown in three different views. This guiding element 2 essentially consists of a guiding plate 21 as well as of a clamping part 24. Integrally formed at the inner side of the guiding plate 21, there is provided a strip member 23. The lower portion 26 of the guiding plate 21 serves for laterally guiding the roller chain, while the guiding plate comprises a rest surface provided at its top side and is designed to support the lower chain run of a circulating chain. The mode of operation of this guiding plate 21 will be further explained herein below with the help of Fig. 3.

The Fig. 2a show the catch member 19 in a side elevation, a front elevation and a top elevation. The catch member 19, preferably manufactured of rubber, serves as a rest for goods to be supported by the chain links. For fixing it in the slot machined into the base portion of the chain link, the catch member 19 comprises a holding portion 15 (*should read "20"*) which is correspondingly designed to the that slot. For fixing, the holding portion 15

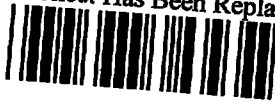
THIS SHEET HAS BEEN
REPLACED



(*should read "20"*) is slid through the slot and, thereafter, the catch member is rotated by 90°. The catch member 19 preferably slightly towers above the projections of the chain link such that light goods do not rest on the projections, but on the catch member. However, by the elastic design of the catch member 19, it is ensured that heavy goods compress the catch member and, thereby rest against the projections, whereby a safe, non-positive connection between chain link and goods to be stored – pallet – is ensured.

Fig. 3 shows a cross section through a support rail 5 as well as a roller chain 8. The support rail 5 comprises, at its top side, a track surface 6 projecting upwards that is laterally limited by two guide faces. At the bottom side, the support rail 5 is provided with a hollow chamber H having an open bottom in which are provided two auxiliary rails 7 on which the guiding plates 21 of the guiding elements 2 rest with their rest surfaces 25 and on which the lower run 8b of the chain is vertically supported.

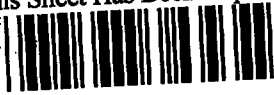
The roller chain 8 is constituted by a plurality of chain links 1 designed according to Fig. 1 and by supporting rollers 3, whereby in each case two chain links are interconnected by a shaft 28 in an articulated manner. The shafts 28 simultaneously serve for bearing the supporting rollers 3. Into the particular shaft 28, a guiding element 2 is inserted which towers below the chain link 1 at one side. At the other side, the clamping part 24 of the guiding element 2 engages the leg 12a whereby both the shaft 28 as well as the guiding element 2 can be fixed in the position shown here. Additionally, for securing the guiding element 2, a safety pin 29 can be provided, as illustrated, which is anchored in a self-locking manner. In order to form a chain of uniform chain links 1, these are arranged alternately rotated by 180° around their height axis, whereby the one chain links is offset with regard to the other chain link, as seen in longitudinal direction of the roller chain, by an amount corresponding to the wall thickness of a leg of a chain link. Besides the chain links 1, also the guiding elements 2 are arranged alternately rotated by 180°; this means, in



other words, the guiding elements 2 are inserted into the particular shaft 28 alternately once from the left side and once from the right side, such that the roller chain 8 is guided on both sides of the track surface 6. The strip member 23 of the guiding element 2 extends along the bottom side of the particular leg of a chain link and prevents the guiding element 2 from being rotated, whereby the height of the strip member 23 approximately corresponds to the wall thickness of a leg of a chain link. It is to add that the roller chain 8 constitutes only approximately 60% of the circulating conveying means, while the remaining 40% consist of a strap that is fixed to the two end of the chain.

Fig. 4 shows a top view of a portion of a roller chain that is provided with uniform chain links 1 according to Fig. 1 as well as with guiding elements 2 according to Fig. 2. It can be seen from this illustration that the chain links 1a, 1b, 1c, 1d are arranged alternately rotated around the height axis by 180° and that the one chain link is offset with regard to the other chain link 1a, 1b, 1c, 1d, as seen in the longitudinal direction of the roller chain 8, by an amount of the wall thickness of the leg of a chain link 1a, 1b, 1c, 1d, such that in each case the one leg 11, 12 of a chain link engages the recess 16 (Fig. 1) in the base portion of the adjacent chain link. This design allows that the chain links 1a, 1b, 1c, 1d, also can take up and transmit lateral forces.

Moreover, it is evident that the mean length L of the base portion 10 at least approximately corresponds to the distance A of the axes of two adjacent supporting rollers 3. The base portion 10 preferably is shorter than the distance of the axes of two adjacent supporting rollers by approximately 0.5 to 3 mm, such that, the chain being in its stretched state, also a gap b in the order of 0.5 to 3 mm is created between the front faces of adjacent base portions 10b, 10c of adjacent chain links 1b, 1c. This design has the effect that the mutual rotational movement of adjacent chain links, exceeding a certain angle of rotation, is limited due to the fact that the front faces of adjacent base portions abut against



each other upon mutual turning back the chain links. In this connection, it is important that the front faces of adjacent base portions of adjacent chain links are designed correspondingly. A roller link designed in such a way, thus, can transmit thrust forces, without the danger that the chain folds together at certain portions.

Fig. 5 shows the portion of the roller chain according to Fig. 4 in a side view. In this illustration, the alternately arranged guiding elements 2 can be seen that tower below the chain links.

A chain conveyor designed in such a way is of very simple construction and can be manufactured at low costs, because both the chain links as well as the guiding elements are of uniform design. By the provision of stop members limiting the mutual rotating movement of adjacent chain links exceeding a predetermined angle in the above explained manner, the roller chain can also transmit thrust forces.

THIS SHEET HAS BEEN
REPLACED

Patent Claims**THIS SHEET HAS BEEN
REPLACED**

1. Chain conveyor with a roller chain (8) and a supporting rail (5) for vertically supporting the roller chain (8), whereby the roller chain comprises a plurality of supporting rollers (3) which are interconnected by means of chain links (1), characterized in that the chain links (1) are provided with stop means that limit the mutual rotating movement of adjacent chain links (1) exceeding a predetermined angle in such a way that the roller chain (8) can transmit thrust forces.

2. Chain conveyor according to claim 1, characterized in that the predominant part of the chain links (1) is of U-shaped design such as to comprise two legs (11, 12) and a base portion (10) located there between, that the mean length (L) of the base portion (10) at least approximately corresponds to the distance (A) of the axes of two adjacent supporting rollers (3), and that the front faces (17, 18) of adjacent base portions (10) of adjacent chain links (1) are of corresponding design and act as stops.

3. Chain conveyor according to claim 2, characterized in that a gap (b) of less than 5% of the length of a chain link (1) exists between the front faces of adjacent chain links when the roller chain (8) is in its stretched state.

4. Chain conveyor according to claim 2 or 3, characterized in that the base portion (10) of the chain links (1) is designed as an upper cover of the roller chain (8) and, the roller chain (8) being in its stretched state, protects both the supporting rollers (3) as well as the supporting rail (5) from contamination.





THIS SHEET HAS BEEN
REPLACED

5. Chain conveyor according to one of the claims 2 to 4, characterized in that the two end portions (17, 18) of the base portion (10) of a chain link (1) comprise a stepping and/or are of oblique design.

6. Chain conveyor according to claim 5, characterized in that the chain links (1) are of one-piece design, and that the leg (12) adjacent to the shorter portion (17a, 18a) of the base portion (10) is provided with a projection (14) towering above the top side of the base portion (10).

7. Chain conveyor according to one of the claims 2 to 6, characterized in that the base portion (10) of the chain links (1) is designed at its top side as a rest surface for goods to be conveyed on the roller chain (8).

8. Chain conveyor according to one of the claims 2 to 7, characterized in that the base portion (10) is provided with two recesses (16) arranged along one leg (11, 12) and having a width (b) that is greater than the wall thickness of a leg (11, 12).

9. Chain conveyor according to one of the preceding claims, characterized in that the roller chain (8) consists of uniform chain links (1) which have a geometry different from a central symmetric shape, and that the chain links (1a, 1b, 1c, 1d) are alternately rotated around their height axis by 180°, whereby the one chain link with regard to the other chain link (1a, 1b, 1c, 1d) in each case is offset, as seen in the longitudinal direction of the roller chain (8), by the thickness of the wall of a leg (11, 12) of a chain link (1).





THIS SHEET HAS BEEN
REPLACED

10. Chain conveyor according to one of the preceding claims, characterized in that the base portion (10) is provided with a slot (15) running transverse to the direction of movement of the roller chain (8), and that a catch member (19) made of an elastic material is provided which comprises a holding part (20) designed correspondingly to that slot and being able to be inserted into the slot (15) and fixed in the base portion (10) by a subsequent rotation of 90°.

11. Chain conveyor according to claim 1, whereby the chain links (1) of the roller chain (8) are interconnected in an articulated manner by means of a shaft (28), and whereby the shaft (28) is designed simultaneously as a supporting axle for the supporting rollers (3), characterized in that the shaft (28) is hollow, and that a discrete guiding element (2) is inserted into the shaft (28) that towers below the chain link (10) at least at one side towards the guiding rail (5).

12. Chain conveyor according to claim 11, characterized in that the guiding element (2) is provided with a strap member (23) to be directed towards the chain link (10) and extending along the lower side of the leg of a chain link (10), whereby the height of the strip member (23) corresponds to maximally the thickness of the wall of a leg (11, 12) of a chain link (10).

13. Chain conveyor according to claim 11 or 12, characterized in that the supporting rail (5) comprises a track surface (6) at the top side which is laterally limited by two guiding faces (31, 32) situated below the track surface, and that each guiding element (2) comprises at least one lateral guiding member (21) which is adapted to cooperate with the guiding faces (31, 32).





THIS SHEET HAS BEEN
REPLACED

14. Chain conveyor according to one of the claims 11 to 13, characterized in that the guiding elements (2) are made of a plastic material which has good self-lubricating properties.

15. Chain conveyor according to one of the claims 11 to 14, comprising deflection devices located at the ends for deflecting the roller chain (8) and for dividing the same into an upper and a lower chain run (8a, 8b), whereby the supporting rail (5) comprises at its bottom side a hollow chamber (H) at least partially receiving the lower run (8b) of the chain, characterized in that the guiding elements (2) project over the chain links (1) of the lower chain run (8a) both downwards towards the guiding rail (5) as well as at least at one side, whereby the portion (26) of the guiding elements (2) towering below the chain links (1) is designed for guiding the upper chain run (8a), and whereby the guiding element (2) comprises a guiding surface (25) in that portion that projects laterally over the chain links (1) for guiding and vertically supporting the lower chain run (8b) which is at least partially received in the hollow chamber (H).

16. Chain conveyor according to one of the preceding claims, characterized in that both ends of the roller chain (8) are interconnected by a strap to a circulating endless conveying means, whereby the length of the roller chain (8) amounts to not more than 60% of the entire conveying means.



Abstract

A chain conveyor has a roller chain (6) *[should read "8"]* and a bearing rail (5) for vertically underpropping the roller chain (6) *[should read "8"]*. The roller chain (6) *[should read "8"]* consists of a plurality of supporting rolls (3) which are interconnected plates (1). The plates are U-shaped in that they have two legs (11, 12) with a base piece (10) between them. The average length (L) of the base piece (10) corresponds at least approximately to the distance (A) between the axes of two adjacent supporting rolls (3). The front sides of the adjacent base parts of adjacent plates are correspondingly configured and act as limit stops, in that they limit the mutual rotation of adjacent plates when it goes beyond a predetermined angle, such that the roller chain can transfer the thrust force. For lateral guidance of the roller chain, discrete guide elements (2) are provided which are pushed through the shafts that pivot the plates.

THIS SHEET HAS BEEN
REPLACED

This Sheet Has Been Replaced





THIS SHEET HAS BEEN
REPLACED

Preferred embodiments of the invention are described in the dependent claims 2 to 10.

A further object of the invention consists in to provide a chain conveyor that is designed with means for laterally guiding the roller chain, which are simply arranged and can be manufactured at low costs, whereby the guide means shall present very low frictional resistances between roller chain and support rail.

This object is met by the characteristics listed in the characterizing portion of claim 11.

In the following, the invention will be further explained, with the help of drawings. In these drawings,

Figs. 1 to 3 show an individual chain link for a roller chain in three different views;

Figs. 4 to 6 show a guiding element for the roller chain in three different views;

Figs. 7 to 9 show a catch member for the roller chain in three different views;

Fig. 10 shows a cross section through a support rail as well as through the roller chain;

Fig. 11 shows a top view of a portion of a roller chain equipped with chain links according to Figs. 1 to 3;

Fig. 12 shows a portion of the roller chain according to Fig. 11 in a side view.

The Figs. 1 to 3 show a chain link 1 for a roller chain in a side elevation, a front elevation and a top elevation. The chain link 1 is designed essentially U-shaped and comprises a base portion 10 as well as two legs 11, 12. The base portion situated between the two legs 11, 12 constitutes the top cover of the chain link 1. Both legs 11, 12 of the chain link 1 are provided with bores 13 which serve for receiving in each case a shaft for interconnecting the chain links 1 and for bearing and supporting a support roller.



The base portion 10 of the chain link 1 is provided with two recesses 16 arranged along one of the legs 11 and having a width b_2 that is greater than the wall thickness of a leg 11, 12. By providing these recesses 16, the assembling of several uniformly designed chain links 1 to a chain is favored inasmuch as one leg 11, 12 of a preceding or subsequent chain link 1, in each case rotated by 180° around the height axis, engages such a recess 16.

Moreover, the base portion 10 is provided with a slot 15 running crosswise to its longitudinal axis. This slot serves for receiving a catch member made of an elastic material, as will be further explained herein below with the help of Figs. 7 to 9.

The basic shape of such a chain link 1 is manufactured preferably by punching, while the U-shaped design is created by a subsequent bending of the punched out part.

The two end portions 17, 18 of the base portion 10 of a chain link 1 are preferably of oblique shape. On the other hand, the two end portions of the base portion can be provided with a stepping, as outlined by the broken lines L.

The one leg 12 is provided with two projections 14 towering above the top side of the base portion 10, whereby, due to manufacturing reasons, in each case the leg 12 adjacent to the shorter portion 17a, 18a of the base portion 10 comprises such projections 14.

In the Figs. 4 to 6, a guiding element 2 for the roller chain is shown in three different views. This guiding element 2 essentially consists of a guiding plate 21 as well as of a clamping part 24. Integrally formed at the inner side of the guiding plate 21, there is provided a strip member 23. The lower portion 26 of the guiding plate 21 serves for laterally guiding the roller chain, while the guiding plate comprises a rest surface provided at its top side and is designed to support the lower chain run of a circulating chain. The mode of

THIS SHEET HAS BEEN
REPLACED



operation of this guiding plate 21 will be further explained herein below with the help of Fig. 10.

The Figs. 7 to 9 show the catch member 19 in a side elevation, a front elevation and a top elevation. The catch member 19, preferably manufactured of rubber, serves as a rest for goods to be supported by the chain links. For fixing it in the slot machined into the base portion of the chain link, the catch member 19 comprises a holding portion 15 (*should read "20"*) which is correspondingly designed to the that slot. For fixing, the holding portion 15 (*should read "20"*) is slid through the slot and, thereafter, the catch member is rotated by 90°. The catch member 19 preferably slightly towers above the projections of the chain link such that light goods do not rest on the projections, but on the catch member. However, by the elastic design of the catch member 19, it is ensured that heavy goods compress the catch member and, thereby rest against the projections, whereby a safe, non-positive connection between chain link and goods to be stored – pallet – is ensured.

Fig. 10 shows a cross section through a support rail 5 as well as a roller chain 8. The support rail 5 comprises, at its top side, a track surface 6 projecting upwards that is laterally limited by two guide faces. At the bottom side, the support rail 5 is provided with a hollow chamber H having an open bottom in which are provided two auxiliary rails 7 on which the guiding plates 21 of the guiding elements 2 rest with their rest surfaces 25 and on which the lower run 8b of the chain is vertically supported.

The roller chain 8 is constituted by a plurality of chain links 1 designed according to Figs. 1 to 3 and by supporting rollers 3, whereby in each case two chain links are interconnected by a shaft 28 in an articulated manner. The shafts 28 simultaneously serve for bearing the supporting rollers 3. Into the particular shaft 28, a guiding element 2 is inserted which towers below the chain link 1 at one side. At the other side, the clamping part 24 of the guiding element 2 engages the leg 12a whereby both the shaft 28 as well as the guid-

THIS SHEET HAS BEEN
REPLACED



ing element 2 can be fixed in the position shown here. Additionally, for securing the guiding element 2, a safety pin 29 can be provided, as illustrated, which is anchored in a self-locking manner. In order to form a chain of uniform chain links 1, these are arranged alternately rotated by 180° around their height axis, whereby the one chain links is offset with regard to the other chain link, as seen in longitudinal direction of the roller chain, by an amount corresponding to the wall thickness of a leg of a chain link. Besides the chain links 1, also the guiding elements 2 are arranged alternately rotated by 180°; this means, in other words, the guiding elements 2 are inserted into the particular shaft 28 alternately once from the left side and once from the right side, such that the roller chain 8 is guided on both sides of the track surface 6. The strip member 23 of the guiding element 2 extends along the bottom side of the particular leg of a chain link and prevents the guiding element 2 from being rotated, whereby the height of the strip member 23 approximately corresponds to the wall thickness of a leg of a chain link. It is to add that the roller chain 8 constitutes only approximately 60% of the circulating conveying means, while the remaining 40% consist of a strap that is fixed to the two end of the chain.

Fig. 11 shows a top view of a portion of a roller chain that is provided with uniform chain links 1 according to Figs. 1 to 3 as well as with guiding elements 2 according to Figs. 4 to 6. It can be seen from this illustration that the chain links 1a, 1b, 1c, 1d are arranged alternately rotated around the height axis by 180° and that the one chain link is offset with regard to the other chain link 1a, 1b, 1c 1d, as seen in the longitudinal direction of the roller chain 8, by an amount of the wall thickness of the leg of a chain link 1a, 1b, 1c, 1d, such that in each case the one leg 11, 12 of a chain link engages the recess 16 (Fig. 3) in the base portion of the adjacent chain link. This design allows that the chain links 1a, 1b, 1c, 1d, also can take up and transmit lateral forces.

THIS SHEET HAS BEEN
REPLACED



Moreover, it is evident that the mean length L of the base portion 10 at least approximately corresponds to the distance A of the axes of two adjacent supporting rollers 3. The base portion 10 preferably is shorter than the distance of the axes of two adjacent supporting rollers by approximately 0.5 to 3 mm, such that, the chain being in its stretched state, also a gap b in the order of 0.5 to 3 mm is created between the front faces of adjacent base portions 10b, 10c of adjacent chain links 1b, 1c. This design has the effect that the mutual rotational movement of adjacent chain links, exceeding a certain angle of rotation, is limited due to the fact that the front faces of adjacent base portions abut against each other upon mutual turning back the chain links. In this connection, it is important that the front faces of adjacent base portions of adjacent chain links are designed correspondingly. A roller link designed in such a way, thus, can transmit thrust forces, without the danger that the chain folds together at certain portions.

Fig. 12 shows the portion of the roller chain according to Fig. 11 in a side view. In this illustration, the alternately arranged guiding elements 2 can be seen that tower below the chain links.

A chain conveyor designed in such a way is of very simple construction and can be manufactured at low costs, because both the chain links as well as the guiding elements are of uniform design. By the provision of stop members limiting the mutual rotating movement of adjacent chain links exceeding a predetermined angle in the above explained manner, the roller chain can also transmit thrust forces.

THIS SHEET HAS BEEN
REPLACED

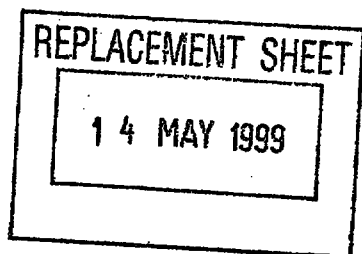
Abstract

This Sheet Has Been Replaced



A chain conveyor comprises a roller chain (6) *[should read "8"]* and a supporting rail (5) for vertically supporting the roller chain (6) *[should read "8"]*. The roller chain (6) *[should read "8"]* consists of a plurality of supporting rollers (3) that are interconnected by means of chain links (1). The chain links are of U-shaped design inasmuch as they comprise two legs (11, 12) and a base portion (10) located there between. The mean length (L) of the base portion (10) corresponds at least approximately to the distance (A) of the axes of two adjacent supporting rollers (3). The front faces of adjacent base portions of adjacent chain links are correspondingly designed and act as stops, inasmuch as they limit the mutual rotating movement of adjacent chain links, exceeding a predetermined angle, in such a way that the roller chain can transmit thrust forces. For laterally guiding the roller chain, discrete guiding elements (2) are provided which are inserted into the shafts that interconnect the chain links in an articulated manner.

(Figs. 3 + 10)

✓
4

Preferred embodiments of the invention are described in the dependent claims 2 to 10.

A further object of the invention consists in to provide a chain conveyor that is designed with means for laterally guiding the roller chain, which are simply arranged and can be manufactured at low costs, whereby the guide means shall present very low frictional resistances between roller chain and support rail.

This object is met by the characteristics listed in the characterizing portion of claim 11.

In the following, the invention will be further explained, with the help of drawings. In these drawings,

Figs. 1 to 3 show an individual chain link for a roller chain in three different views;

Figs. 4 to 6 show a guiding element for the roller chain in three different views;

Figs. 7 to 9 show a catch member for the roller chain in three different views;

Fig. 10 shows a cross section through a support rail as well as through the roller chain;

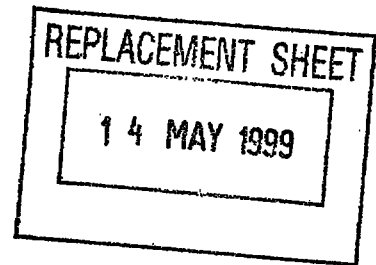
Fig. 11 shows a top view of a portion of a roller chain equipped with chain links according to Figs. 1 to 3;

Fig. 12 shows a portion of the roller chain according to Fig. 11 in a side view.

The Figs. 1 to 3 show a chain link 1 for a roller chain in a side elevation, a front elevation and a top elevation. The chain link 1 is designed essentially U-shaped and comprises a base portion 10 as well as two legs 11, 12. The base portion situated between the two legs 11, 12 constitutes the top cover of the chain link 1. Both legs 11, 12 of the chain link 1 are provided with bores 13 which serve for receiving in each case a shaft for interconnecting the chain links 1 and for bearing and supporting a support roller.

AMENDED SHEET

2
5



The base portion 10 of the chain link 1 is provided with two recesses 16 arranged along one of the legs 11 and having a width b_2 that is greater than the wall thickness of a leg 11, 12. By providing these recesses 16, the assembling of several uniformly designed chain links 1 to a chain is favored inasmuch as one leg 11, 12 of a preceding or subsequent chain link 1, in each case rotated by 180° around the height axis, engages such a recess 16.

Moreover, the base portion 10 is provided with a slot 15 running crosswise to its longitudinal axis. This slot serves for receiving a catch member made of an elastic material, as will be further explained herein below with the help of Figs. 7 to 9.

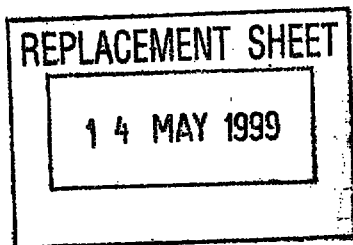
The basic shape of such a chain link 1 is manufactured preferably by punching, while the U-shaped design is created by a subsequent bending of the punched out part.

The two end portions 17, 18 of the base portion 10 of a chain link 1 are preferably of oblique shape. On the other hand, the two end portions of the base portion can be provided with a stepping, as outlined by the broken lines L.

The one leg 12 is provided with two projections 14 towering above the top side of the base portion 10, whereby, due to manufacturing reasons, in each case the leg 12 adjacent to the shorter portion 17a, 18a of the base portion 10 comprises such projections 14.

In the Figs. 4 to 6, a guiding element 2 for the roller chain is shown in three different views. This guiding element 2 essentially consists of a guiding plate 21 as well as of a clamping part 24. Integrally formed at the inner side of the guiding plate 21, there is provided a strip member 23. The lower portion 26 of the guiding plate 21 serves for laterally guiding the roller chain, while the guiding plate comprises a rest surface provided at its top side and is designed to support the lower chain run of a circulating chain. The mode of

AMENDED SHEET



~~8~~
6

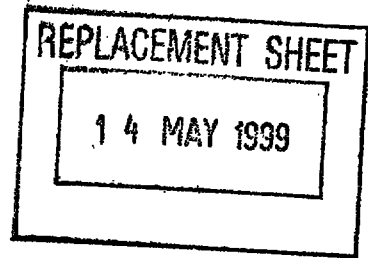
operation of this guiding plate 21 will be further explained herein below with the help of Fig. 10.

The Figs. 7 to 9 show the catch member 19 in a side elevation, a front elevation and a top elevation. The catch member 19, preferably manufactured of rubber, serves as a rest for goods to be supported by the chain links. For fixing it in the slot machined into the base portion of the chain link, the catch member 19 comprises a holding portion ²⁰~~15~~ ~~(should read~~ ²⁰~~20)~~ which is correspondingly designed to the that slot. For fixing, the holding portion ~~15~~ ~~(should read "20")~~ is slid through the slot and, thereafter, the catch member is rotated by 90°. The catch member 19 preferably slightly towers above the projections of the chain link such that light goods do not rest on the projections, but on the catch member. However, by the elastic design of the catch member 19, it is ensured that heavy goods compress the catch member and, thereby rest against the projections, whereby a safe, non-positive connection between chain link and goods to be stored – pallet – is ensured.

Fig. 10 shows a cross section through a support rail 5 as well as a roller chain 8. The support rail 5 comprises, at its top side, a track surface 6 projecting upwards that is laterally limited by two guide faces. At the bottom side, the support rail 5 is provided with a hollow chamber H having an open bottom in which are provided two auxiliary rails 7 on which the guiding plates 21 of the guiding elements 2 rest with their rest surfaces 25 and on which the lower run 8b of the chain is vertically supported.

The roller chain 8 is constituted by a plurality of chain links 1 designed according to Figs. 1 to 3 and by supporting rollers 3, whereby in each case two chain links are interconnected by a shaft 28 in an articulated manner. The shafts 28 simultaneously serve for bearing the supporting rollers 3. Into the particular shaft 28, a guiding element 2 is inserted which towers below the chain link 1 at one side. At the other side, the clamping part 24 of the guiding element 2 engages the leg 12a whereby both the shaft 28 as well as the guid-

AMENDED SHEET



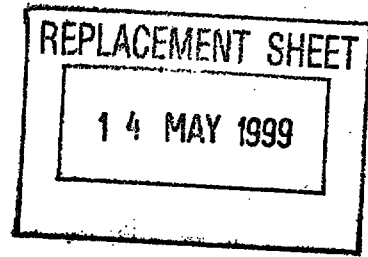
7

ing element 2 can be fixed in the position shown here. Additionally, for securing the guiding element 2, a safety pin 29 can be provided, as illustrated, which is anchored in a self-locking manner. In order to form a chain of uniform chain links 1, these are arranged alternately rotated by 180° around their height axis, whereby the one chain links is offset with regard to the other chain link, as seen in longitudinal direction of the roller chain, by an amount corresponding to the wall thickness of a leg of a chain link. Besides the chain links 1, also the guiding elements 2 are arranged alternately rotated by 180° ; this means, in other words, the guiding elements 2 are inserted into the particular shaft 28 alternately once from the left side and once from the right side, such that the roller chain 8 is guided on both sides of the track surface 6. The strip member 23 of the guiding element 2 extends along the bottom side of the particular leg of a chain link and prevents the guiding element 2 from being rotated, whereby the height of the strip member 23 approximately corresponds to the wall thickness of a leg of a chain link. It is to add that the roller chain 8 constitutes only approximately 60% of the circulating conveying means, while the remaining 40% consist of a strap that is fixed to the two end of the chain.

Fig. 11 shows a top view of a portion of a roller chain that is provided with uniform chain links 1 according to Figs. 1 to 3 as well as with guiding elements 2 according to Figs. 4 to 6. It can be seen from this illustration that the chain links 1a, 1b, 1c, 1d are arranged alternately rotated around the height axis by 180° and that the one chain link is offset with regard to the other chain link 1a, 1b, 1c 1d, as seen in the longitudinal direction of the roller chain 8, by an amount of the wall thickness of the leg of a chain link 1a, 1b, 1c, 1d, such that in each case the one leg 11, 12 of a chain link engages the recess 16 (Fig. 3) in the base portion of the adjacent chain link. This design allows that the chain links 1a, 1b, 1c, 1d, also can take up and transmit lateral forces.

AMENDED SHEET

~~5~~
8



Moreover, it is evident that the mean length L of the base portion 10 at least approximately corresponds to the distance A of the axes of two adjacent supporting rollers 3. The base portion 10 preferably is shorter than the distance of the axes of two adjacent supporting rollers by approximately 0.5 to 3 mm, such that, the chain being in its stretched state, also a gap b in the order of 0.5 to 3 mm is created between the front faces of adjacent base portions 10b, 10c of adjacent chain links 1b, 1c. This design has the effect that the mutual rotational movement of adjacent chain links, exceeding a certain angle of rotation, is limited due to the fact that the front faces of adjacent base portions abut against each other upon mutual turning back the chain links. In this connection, it is important that the front faces of adjacent base portions of adjacent chain links are designed correspondingly. A roller link designed in such a way, thus, can transmit thrust forces, without the danger that the chain folds together at certain portions.

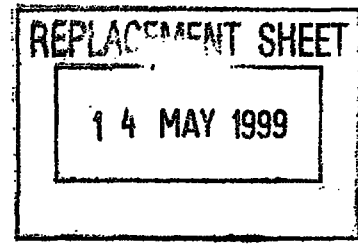
Fig. 12 shows the portion of the roller chain according to Fig. 11 in a side view. In this illustration, the alternately arranged guiding elements 2 can be seen that tower below the chain links.

A chain conveyor designed in such a way is of very simple construction and can be manufactured at low costs, because both the chain links as well as the guiding elements are of uniform design. By the provision of stop members limiting the mutual rotating movement of adjacent chain links exceeding a predetermined angle in the above explained manner, the roller chain can also transmit thrust forces.

AMENDED SHEET

8

13

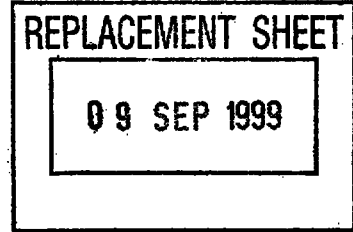


Abstract

A chain conveyor comprises a roller chain ⁽⁸⁾~~(6)~~ ~~[should read "8"]~~ and a supporting rail ⁽⁸⁾~~(5)~~ for vertically supporting the roller chain ⁽⁸⁾~~(6)~~ ~~[should read "8"]~~. The roller chain ⁽⁸⁾~~(6)~~ ~~[should read "8"]~~ consists of a plurality of supporting rollers (3) that are interconnected by means of chain links (1). The chain links are of U-shaped design inasmuch as they comprise two legs (11, 12) and a base portion (10) located there between. The mean length (L) of the base portion (10) corresponds at least approximately to the distance (A) of the axes of two adjacent supporting rollers (3). The front faces of adjacent base portions of adjacent chain links are correspondingly designed and act as stops, inasmuch as they limit the mutual rotating movement of adjacent chain links, exceeding a predetermined angle, in such a way that the roller chain can transmit thrust forces. For laterally guiding the roller chain, discrete guiding elements (2) are provided which are inserted into the shafts that interconnect the chain links in an articulated manner.

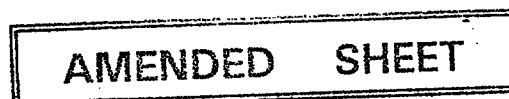
(Figs. 3 + 10)

AMENDED SHEET



CLAIMS

1. Chain conveyor with a roller chain (8) and a supporting rail (5) for vertically supporting the roller chain (8), whereby the roller chain comprises a plurality of supporting rollers (3) which are interconnected by means of chain links (1) which the predominant part of the chain links is of U-shaped design such as to comprise two legs (11,12) and a base portion (10) located there between, the mean length (L) of the base portion (1) at least approximately corresponds to the distance (A) of the axes of two adjacent supporting rollers (3) and the two end portions (17,18) of the base portion (10) of a chain link (1) comprise stepping and/or are of oblique design.
2. Chain conveyor according to Claim 1 characterised in that a gap (b) of less than 5% of length of a chain link (1) exists between the front faces (17,18) of adjacent chain links (1) when the roller chain (8) is in its stretched state.
3. Chain conveyor according to Claim 1 or 2 characterised in that the base portion (1) of the chain links (1) is designed as an upper cover of the roller chain (8) and the roller chain (8) being in its stretched state protects both the supporting rollers (3) as well as the supporting rail (5) from contamination.
4. Chain conveyor according to Claim 1 characterised in that the chain links (1) are of one-piece design and the leg (12) adjacent to the shorter portion (17a, 18a) of the base portion (10) is provided with a projection (14) towering above the top side of the base portion (10).
5. Chain conveyor according to any one of the preceding claims characterised in that the base portion (10) of the chain links (1) is designed at its top side as a rest surface for goods to be conveyed on a roller chain (8).
6. Chain conveyor according to any one of the preceding claims





characterised in that the base portion (1) is provided with two recesses (16) arranged along one leg (11,12) and having a width (b) that is greater than the wall thickness of a leg (11,12).

7. Chain conveyor according to one of the preceding claims, characterised in that the roller chain (8) consists of uniform chain links (1) which have a geometry different from a central symmetric shape, and that the chain links (1a, 1b, 1c, 1d) are alternately rotated around their heights axis by 180°, whereby the one chain link with regard to the other chain link (1a, 1b, 1c, 1d) in each case is offset, as seen in the longitudinal direction of the roller chain (8), by the thickness of the wall of a leg (11, 12) of a chain link (1).

8. Chain conveyor according to one of the preceding claims, characterised in that the base portion (10) is provided with a slot (15) running transverse to the direction of movement of the roller chain (8), and that a catch member (19) made of an elastic material is provided which comprises a holding part (20) designed correspondingly to that slot and being able to be inserted into the slot (15) and fixed in the base portion (10) by a subsequent rotation of 90°.

9. Chain conveyor according to claim 1, whereby the chain links (1) of the roller chain (8) are interconnected in an articulated manner by means of a shaft (28), and whereby the shaft (28) is designed simultaneously as a supporting axle for the supporting rollers (3), characterised in that the shaft (28) is hollow, and that a discrete guiding element (2) is inserted into the shaft (28) that towers below the chain link (10) at least at one side towards the guiding rail (5).

10. Chain conveyor according to claim 9, characterised in that the guiding element (2) is provided with a strap member (23) to be directed towards the chain link (10) and extending along the lower side of the leg of a chain link (10), whereby the height of the strip member (23) corresponds to maximally the thickness of the wall of a leg (11, 12) of a chain link (10).

AMENDED SHEET

REPLACEMENT SHEET

09 SEP 1999



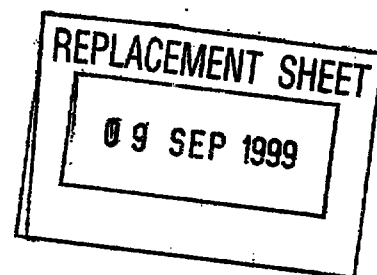
11. Chain conveyor according to any one of claims 9 or 10, characterised in that the supporting rail (5) comprises a track surface (6) at the top side which is laterally limited by two guiding faces (31, 32) situated below the track surface, and that each guiding element (2) comprises at least one lateral guiding member (21) which is adapted to cooperate with the guiding faces (31, 32).

12. Chain conveyor according to any one of claims 9 to 11, characterised in that the guiding elements (2) are made of a plastic material which has good self-lubricating properties.

13. Chain conveyor according to any one of claims 19 to 12, comprising deflection devices located at the ends for deflecting the roller chain (8) and for dividing the same into an upper and a lower chain run (8a, 8b), whereby the supporting rail (5) comprises at its bottom side a hollow chamber (H) at least partially receiving the lower run (8b) of the chain, characterised in that the guiding elements (2) project over the chain links (1) of the lower chain run (8a) both downwards towards the guiding rail (5) as well as at least at one side, whereby the portion (26) of the guiding elements (2) towering below the chain links (1) is designed for guiding the upper chain run (8a), and whereby the guiding element (2) comprises a guiding surface (25) in that portion that projects laterally over the chain links (1) for guiding and vertically supporting the lower chain run (8b) which is at least partially received in the hollow chamber (H).

14. Chain conveyor according to one of the preceding claims, characterised in that both ends of the roller chain (8) are interconnected by a strap to a circulating endless conveying means, whereby the length of the roller chain (8) amounts to not more than 60% of the entire conveying means.

AMENDED SHEET





(51) Internationale Patentklassifikation ⁶: B65G 1/06, F16G 13/02	A1	(11) Internationale Veröffentlichungsnummer: WO 98/23507 (43) Internationales Veröffentlichungsdatum: 4. Juni 1998 (04.06.98)
(21) Internationales Aktenzeichen: PCT/CH97/00385 (22) Internationales Anmeldedatum: 18. Oktober 1997 (10.10.97) (30) Prioritätsdaten: 2915/96 27. November 1996 (27.11.96) CH (71) Anmelder (für alle Bestimmungsstaaten ausser US): GILGEN FÖRDERSYSTEME AG [CH/CH]; Wangentalstrasse 252, CH-3173 Oberwangen (CH). (72) Erfinder; und (75) Erfinder/Anmelder (nur für US): HALDIMANN, Hans-Rudolf [CH/CH]; Via Boss, 17, CH-6900 Lugano (CH). (74) Anwalt: ROTTMANN, ZIMMERMANN & PARTNER AG; Glattalstrasse 37, CH-8052 Zürich (CH).		(81) Bestimmungsstaaten: AU, CA, CN, JP, KR, SG, US, europäisches Patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Veröffentlicht Mit internationalem Recherchenbericht.

(54) Title: CHAIN CONVEYOR**(54) Bezeichnung:** KETTENFÖRDERER**(57) Abstract**

A chain conveyor has a roller chain (6) and a bearing rail (5) for vertically underpropping the roller chain (6). The roller chain (6) consists of a plurality of supporting rolls (4) which are inter-connected by plates. The plates are U-shaped, in that they have two legs (11, 12) with a base piece (10) between them. The average length (L) of the base piece (10) corresponds at least approximately to the distance (A) between the axes of two adjacent supporting rolls (3). The front-sides of the adjacent base parts of adjacent plates are correspondingly configured and act as limit stops, in that they limit the mutual rotation of adjacent plates when it goes beyond a pre-determined angle, such that the roller chain can transfer the thrust force. For lateral guidance of the roller chain, discrete guide element (2) are provided, which are pushed through the shafts that pivot the plates.

(57) Zusammenfassung

Ein Kettenförderer weist eine Rollenkette (6) und eine Tragschiene (5) zum vertikalen Abstützen der Rollenkette (6) auf. Die Rollenkette (6) besteht aus einer Vielzahl von Tragrollen (4), welche mittels Laschen (1) miteinander verbunden sind. Die Laschen sind U-förmig ausgebildet, indem sie zwei Schenkel (11, 12) und einen dazwischen liegenden Basisteil (10) aufweisen. Die mittlere Länge (L) des Basisteils (10) entspricht zumindest annähernd dem Achsabstand (A) von zwei benachbarten Tragrollen (3). Die Stirnseiten benachbarter Basisteile von benachbarten Laschen sind korrespondierend ausgebildet und wirken als Anschläge, indem sie die gegenseitige, über einen vorbestimmten Winkel hinausgehende Drehbewegung benachbarter Laschen derart begrenzen, dass die Rollenkette Schubkräfte übertragen kann. Zur seitlichen Führung der Rollenkette sind diskrete Führungselemente (2) vorgesehen, welche durch die, die Laschen gelenkig miteinander verbindenden Wellen hindurchgeschoben sind.

