A carrier for a hauling system of the kind comprising a reciprocating pulling rope (25) which runs along the transport line, and a plurality of carriers (10) adapted to be removably attached to the rope at any desired position and to be released from the rope at a predetermined point in order to relieve the load. The carrier comprises a housing (11, 12, 13, 14) which houses a lock which is adapted to be wedged against the rope and to bring along the load with the rope as this moves in one direction and to slip on the rope without moving the load as the rope moves in the opposite direction. The lock comprises a wedge member (20) which is wedge shaped in itself and is restricted movable in the housing and which is adapted to rest against the rope under at least some friction also in rest position, during the return stroke of the rope. The wedge member (20) has a length of from at least two and up to preferably five or more times the diameter of the rope (25). The wedge member (20) may comprise two mutually spaced wedge elements (18, 19) which are joined to each other by means of an intervening web (26) and between which there is formed a sidewardly open channel (23) for the pulling rope (25).
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Carrier for a hauling system.

The present invention relates to a carrier for a hauling system, particularly for transport of felled trees in the forest.

More specifically, the invention relates to a carrier for a hauling system of the kind which comprises an elongated element disposed along the transport line and movable back and forth by means of a drive mechanism, and a plurality of carriers adapted to be removably attached to the elongated element at any desired positions and to be removed from the elongated element at a predetermined position to release the load.

A hauling system of this general class is disclosed in the Swedish patent 78089-2. The carriers of the hauling system as disclosed therein comprise a lock, adapted to be forced against the elongated element by wedge action and adapted to be brought along with the elongated element as this moves in one direction whereas they slip on the element without moving the load, as the element moves in the opposite direction.

The hauling system according to the just mentioned patent is characterized in that the elongated element consists of a flexible strap, preferably of a synthetic textile material, and in that the carriers consist of a longitudinally slotted sleeve or cylinder, having a latch mechanism which blocks the slot of the sleeve at least partially. The latch mechanism is adapted to be actuated by an ejector adjacent the elongated element, which ejector is adapted to move the latch into a slot opening position.

According to another patent, viz. Swedish patent 7904518-3 the pulling strap is provided with a plurality of mutually spaced, fixed thickenings, preferably in the shape of rubber beads disposed in the textile strap, to permit an efficient locking of the pulling strap without wedging of the lock.

In practical operation a drive mechanism at one end of the strap is used to pull the strap in one direction, whereas a spring or the like at the other end of the strap
is used to pull the strap in the opposite direction so as to impart to the strap a reciprocating motion with a stroke of from some decimeters up to some tenths of meters, depending on the design of the drive mechanism.

Pulling straps of the just disclosed design are expensive in manufacture and may be difficult to replace in as much as they are pronounced special products and not standard wares. Beyond this drawback pulling straps of the just disclosed type suffer from the drawback that the engagement of the carrier with the strap always takes place at one and the same points, viz. on the fixed thickenings or close adjacent these. In this way the wear will be concentrated to certain points which, of course, is inappropriate.

The object of the present invention has been to remedy the just mentioned drawbacks, and to this end the carrier according to the present invention has been designed so as is defined in principle in the characterizing clause of claim 1.

The invention will be disclosed in more details below with reference had to the accompanying drawings.

Fig. 1 shows a first embodiment of a carrier according to the invention in side view and partially in section along the plane I-I in fig. 2;

Fig. 2 shows the carrier in fig. 1 in cross-section along the plane II-II in fig. 1;

Fig. 3 shows in perspective and to a slightly enlarged scale a wedge means for use in the carrier of fig. 1;

Fig. 4 is a side view of a second embodiment of the carrier according to the invention;

Fig. 5 shows the carrier of fig. 4 in cross-section along the plane V-V in fig. 4;

Fig. 6 is a perspective view of a third embodiment of the carrier according to the invention.

The embodiment of the carrier according to the invention which has been shown as an example in figs. 1 and 2 comprises a housing, generally denoted 10, comprising upper and lower walls 11 and 12, respectively, a rear wall 13 and a front wall 14. The last mentioned wall has a
side opening or slot 15 of suitable design which runs all the way along the carrier. The carrier housing 10 is provided with upper and lower wedgeshaped ramps 16 and 17 which are adapted to cooperate with wedge surfaces 18, 19 of a wedge member, generally denoted 20 in fig. 3.

As shown in fig. 3, in the present case, the wedge member comprises two mutually spaced wedges 21, 22 between which there is formed a space 23 to receive the pulling strap 25 as shown in figs. 1 and 2. The two wedges 21 and 22 are held together by means of a backing or web 26 disposed between them as shown in figs. 2 and 3. In the present case the space 23 has the shape of a groove of rectangular cross section and of constant cross sectional shape along the full length but it should be mentioned that the cross sectional shape may be adapted to the pulling ropes that are contemplated for use. Further it would be possible to provide the wedges 21, 22 with internal embossments or the like in order to increase the frictional engagement with the pulling rope at certain points or at several points along the length of the wedges. However, as will be disclosed in more details below, the frictional engagement should not be greater than to permit the wedge member 20 and therewith the carrier 10 as a whole to "slip" slightly on the rope 25 as the rope is moved in one direction. It should be noted that the wedges 21, 22 are slightly rounded at the smaller ends thereof, as is shown particularly clearly in fig. 3, i.e. in order to prevent problems with respect to the slipping of the wedges on the pulling rope 25 in one direction.

To ensure a limited movable connection between the wedge member 20 and the carrier housing the wedge member 20 in the example shown is provided with a pin 27 which is entered into a bore or slot 28 in the side wall 13 of the carrier housing. To further ensure that the wedge member 20 remains within the carrier housing by movements of the pulling rope 25 in one direction, viz. to the right as seen in fig. 1, it is also possible to provide the space for the wedge member 20 within the carrier housing with
abutment shoulders 29,30 which restrict movements of the wedge member in relation to the carrier housing towards the right as seen in fig. 1.

The wedge member 20 may consist of any material which is suitable for the purpose, such as "Delrin" or the like. It should be realised that the exact geometrical design of the wedge member 20 and the ramp shaped wedge surfaces 16,17 cooperating therewith should be adapted to the requirements in each case. Generally, it would appear that the wedge member 20 should extend along a predetermined length of the pulling strap so that the total engagement therewith becomes sufficient to transfer very great forces without undue point loads on the pulling rope 25. Further, it is contemplated that the design of the wedge surfaces 16,17,20,22 should be such that the wedge member engages around the pulling rope 25 with great force as the rope is moved in one direction, whereas, on the other hand, as the pulling rope is moved in the opposite direction, the wedge shaped member 20 should be comparatively easily released from the ramp shaped wedge surfaces 16,17 within the carrier housing and thus relieve its grip around the pulling rope 25 so that the rope is permitted to move in relation to the wedge member 20 and the carrier as a whole.

In operation the just disclosed system functions in the following manner: First, the wedge member 20 is inserted into the carrier housing in the position as shown in fig. 1, and then the carrier as a whole is attached to the reciprocating pulling rope 25 at any desired position in that the rope is introduced into the carrier through the slot 15. Then, there is hooked up on the ring 24 a wire strap (not shown) to which the occasional load is attached, e.g. in the shape of felled trees. As the pulling rope 25 is moved in the working direction, shown by the arrow A in fig. 1, the carrier 10 is brought along with the rope due to the engagement of the wedge member 20 with the rope 25, and thus the load is moved a predetermined step towards left as seen in fig. 1. Then, the pulling rope 25 returns in the return direction, shown by
the arrow R, and will thereby at first bring along the 
carrier 10 towards right as seen in fig. 1, until the 
slack of the wire strap has been taken up. At this moment 
the carrier housing is stopped whereas the wedge member 20 
performs a restricted movement towards right until also 
this member is stopped, viz. in the example in that the 
pin 27 abuts the rearmost end of the slot 28 or in that 
the wedge member abuts the abutment shoulders 29,30. Then, 
the wedge member and therewith also the carrier 10 as a 
whole starts to "slip" on the pulling rope 25 which 
proceeds still a further way towards the right as seen in 
fig. 1. Then, the pulling 25 rope reverses and again 
moves in direction of the arrow A whereby the carrier 10, 
having first taken up the slack of the wire strap, again 
grips around the pulling rope 25 so as to move the load 
another step in direction of the arrow A. Thus, in this 
way the load is moved stepwise in direction towards left 
as seen in fig. 1.

In the receiving station the load is released either 
in that the wire strap is released from the ring 24 in 
which case the carrier 10 remains sitting on the pulling 
rope 25 and moves back and forth together therewith 
without transporting any load, or is the releasing brought 
about by removing the carrier 10 as a whole from the 
pulling rope 25, e.g. by means of a mechanism which pushes 
off the carrier 10 sidewardly from the pulling rope 25.

The carrier according to the present invention differs 
from prior art carriers in a very important respect, viz. 
with regard to the extent of the engagement between the 
locking means and the pulling rope. The lock of the prior 
art carriers, which is adapted to be brought into engage-
ment with the rope by a wedging action in order to bring 
along the load by movement of the rope in one direction 
and to slip on the rope without moving the load, consists 
of a ball which operates in a conically tapering space. 
At reasonable dimensions this ball can naturally only make 
a point contact or a restricted line contact with the 
pulling rope, which in a practical embodiment has the 
shape of a flat flexible strap with rubber inserts sewn in
at spaced intervals. Due to the point contacts or line contacts the flexible strap will be subjected to wear stresses pointwise, particularly close to the rubber inserts, which, of course, is inappropriate. Further, to permit transmittal of great forces, i.e. for transport of heavier loads, although only point contact exists, the conically tapering space must have such a conicity in relation to the diameter of the ball, that a locking wedging occurs easily. Such a locking means that the carrier does not slip on the pulling rope during the reverse movement thereof but rather, in the best case, that the load will be pulled back and forth, or that the hauling system is brought out of operation as a consequence of that the return pulling spring is not able to bring about the reverse stroke of the pulling rope.

The just mentioned drawbacks are remedied with the carrier according to the invention, among other things in that the wedge member engages with the pulling rope for a considerable distance, viz. corresponding to from at least two and preferably to five or even more times the smallest cross-dimension (diameter) of the pulling rope. Because the wedge member is wedge-shaped itself and is adapted to cooperate with at least one ramp shaped wedge surface the angle of the wedge surfaces 16, 17, 21, 22 may further be chosen so big that no risk for a locking wedging exists. Further, as very big forces may be transmitted with no need for engagement enhancing inserts or the like one gets full freedom to use any standard pulling rope, such as in the shape of a usual commercially available steel wire or a rope of nylon, "Kevlar" or the like.

The embodiment as shown in figs. 4 and 5 comprises a jaw element 30 which is adapted to be placed on the pulling rope 25 at any desired position and a second jaw element 31 which is movable in relation to the element 30 and is connected to the element 30 by means of two pivotally journalled links 32, 33. The links 32, 33 are pivotally journalled to the two jaw elements 30, 31 by means of pivot pins 34, 35, 36, 37, and the right hand link 33, as seen in the drawing is extended beyond the lower pivot pin.
37 so as to form a two armed lever, the lowermost arm of which is provided with a ring to which a load may be hooked.

On the inner sides thereof the jaw elements 30,31 may be provided with friction increasing irregularities or may be provided with friction increasing coatings. The jaws 30,31 may be profiled in a suitable way to prevent that the rope, on the return stroke, is pulled out from the gap between the jaws, as is shown in fig. 5.

It will be noted that the links 32,33 together with the jaws 30,31 form a so called parallelogram link system which results in that the jaws 30,31 are moved closer to each other by a pivotal movement of the lever comprising the link 33 anti-clockwise around the pivot pin 37, which leads to that the carrier as a whole is clamped strongly around the pulling rope 25 as this is moved towards the left as seen in fig. 4, illustrated by the arrow A.

It should be easily realised that it is possible, by proper choice of the distance between the pivot pins 34,36 and 35,37, as well as the distance from the pivot pint 37 to the ring 38, to vary the force with which the jaws 30,31 are pressed against the pulling rope 25 so that any desired engagement force is obtained.

The carrier as shown in fig. 6 comprises a housing 40 having a slot 41 therein to receive the pulling rope (not shown). A slot 42 in the housing 40 intersects the slot 41 under an angle of say 10 to 20 degrees and received therein is a wedge 43 of T-shaped cross section. At least one of the surfaces of the wedge 43 is provided with an anti-friction coating 44. The wedge 43 is biased to move to the right as seen in fig. 6 by means of one or more springs (not shown), i.e. in the direction of the arrow B in fig. 6. The innermost end of the wedge which is adapted to engage with the pulling rope, is preferably serrated to enhance the engagement with the rope in a manner to prevent jamming thereof. One side of the slot 41 has two upstanding pins 45,46 which are spring biased into a position to bridge the slot and thus to releasably lock the pulling rope in the slot. The pins may be
adapted to be easily depressed by means of the pulling rope itself as the rope is introduced into the slot, and the pins 45,46 may be depressed either manually or automatically in order to permit removal of the rope and the unloading station. As described above the carrier is provided with a ring 47 to receive a load strap of suitable design.

A plurality of modifications and alterations as to details may be carried out within the scope of the invention.
CLAIMS.

1. A carrier for a hauling system of the kind which comprises an elongated element (25) disposed along the transport line and movable back and forth by means of a drive mechanism, and a plurality of carriers (10) adapted to be removably attached to the element at any desired positions and to be removed from the elongated element at a predetermined position to release the load, said carrier comprising a housing (11,12,13,14) which houses a lock, adapted to be pressed against the elongated element by wedging action and adapted to bring along the load with the elongated element (25) by movements thereof in one direction, and to slip on the element without moving the load by movements of the element in the opposite direction, characterized in that the lock comprises a wedge member (20) which is wedge shaped itself and is restricted movable within the carrier housing, and which is adapted to rest against the pulling rope (25) with at least some friction, also in rest position, during the return stroke of the pulling rope (25), and which has a length corresponding to from at least two and up to preferably five or more times the smallest cross dimension (the diameter) of the pulling rope (25).

2. A carrier according to claim 1, characterized in that the wedge member (20) comprises two mutually spaced wedge elements (18,19) which are joined to each other by means of an intervening web (26) and between which there is formed a sidewardly open channel (23) for the pulling rope (25).
**INTERNATIONAL SEARCH REPORT**

International Application No. PCT/SE82/00350

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**I. CLASSIFICATION OF SUBJECT MATTER**

According to International Patent Classification (IPC) or to both National Classification and IPC:

- B 65 G 7/12, B 61 B 12/12

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**II. FIELDS SEARCHED**

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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched:

SE, NO, DK, FI classes as above

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**III. DOCUMENTS CONSIDERED TO BE RELEVANT**

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**IV. CERTIFICATION**

Date of the Actual Completion of the International Search: 1983-01-20

Date of Mailing of this International Search Report: 1983-01-26

International Searching Authority: Swedish Patent Office

Signature of Authorized Officer: Ake Carlsson

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