Sept. 5, 1961 J. R. HUBER 2,998,625

STRAP TYPE SECURING APPARATUS

Filed March 23, 1959

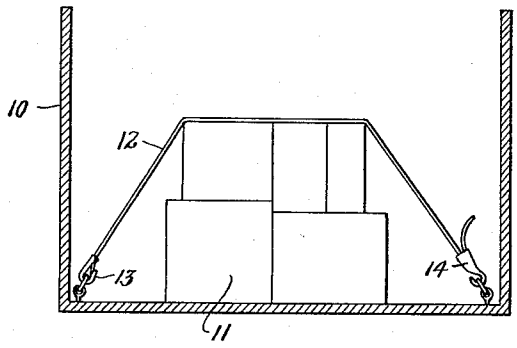


Fig. 1.

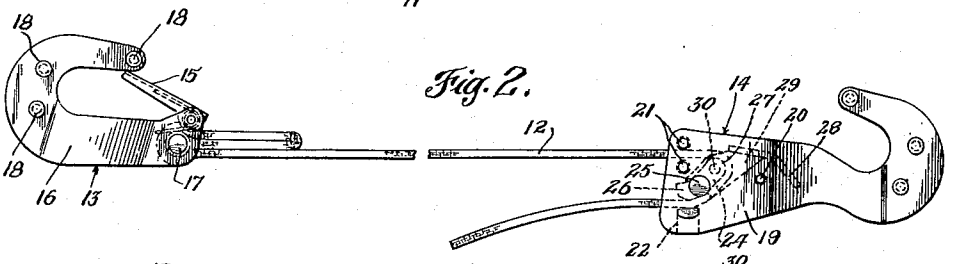


Fig. 2.

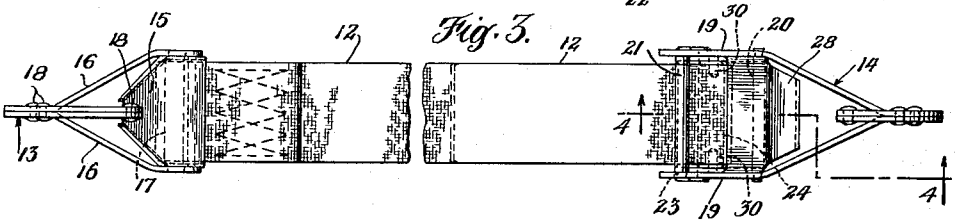


Fig. 3.

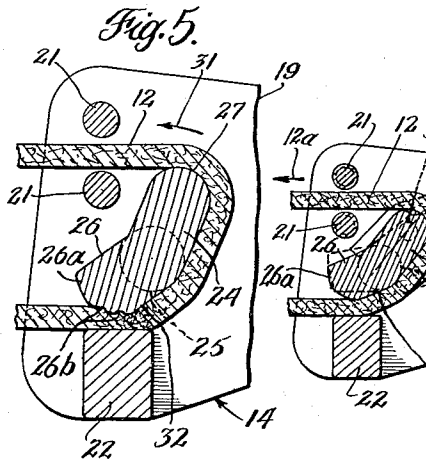


Fig. 5.

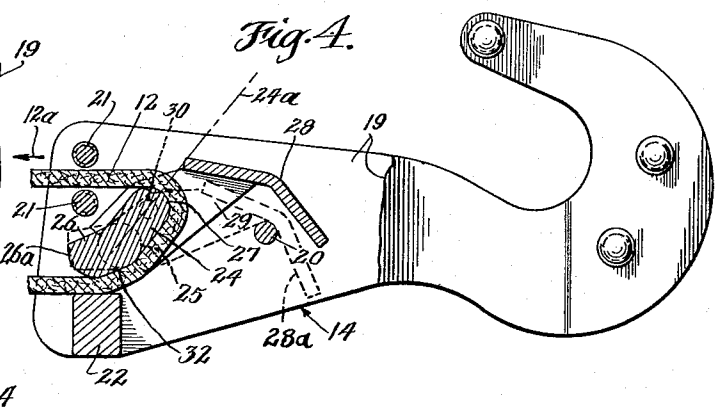


Fig. 4.

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United States Patent Office 2,998,625
Patented Sept. 5, 1961

2,998,625

STRAP TYPE SECURING APPARATUS

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Filed Mar. 23, 1959, Ser. No. 801,214
1 Claim. (Cl. 24—134)

This invention relates to securing apparatus and is more particularly concerned with adjusting and clamping devices for use with web or strap type tension members.

One of the important uses for securing apparatus of this nature is in connection with the retention of cargo to prevent its shifting during transportation. The equipment of the present invention incorporates a tension strap member with a terminal fitting at one end and an engaging fitting which may be positioned at different locations along the strap member to permit adjustment of the length and the transfer of load at any adjusted position.

One of the primary objects of the invention is the provision of an improved and simplified strap length adjustment mechanism which includes non-slipping clamping structure to permit transfer of the load from the strap to the adjustment structure at any selected point.

A further object of the invention is the provision of a quick acting strap clamping mechanism which will engage the strap and clamp it without damage, the applied clamping pressure being in proportion to the tension load in the strap member.

Another object of the invention is the provision of an adjustment mechanism which allows the application of initial tension to the strap by manually pulling on the unloaded end of the strap member parallel to the loaded portion of the strap member but in the opposite direction, thereby providing complete tension loading of the strap and both terminals to assure complete removal of slack and give improved initial tension conditions.

A still further object of the invention is the provision of an improved mechanism for releasing the load in the strap and for permitting easy movement of the strap with a minimum of drag during length adjustment prior to applying the initial tension load. A special shape of cam having a flat portion to give added clearance in the release position is used to provide free movement of the strap through the adjusting member in the unloaded condition.

An important object of the invention is the provision of load transfer structure which involves the direct transfer of the load from the strap to the terminal directly through the clamp member without the need for additional anchoring or direction reversing structure. This feature provides for a reduction in the number of parts and permits shorter and more compact construction of the clamping and anchoring mechanism.

The manner in which the foregoing objects and advantages of the invention are accomplished will be clear from the following description of the drawings, in which:

FIG. 1 is a schematic view showing how the securing equipment of the present invention may be used.

FIG. 2 is an elevational view of the end portions of the securing apparatus shown in FIG. 1.

FIG. 3 is a plan view of the securing apparatus.

FIG. 4 is a sectional view on an enlarged scale taken along the line 4—4 of FIG. 3 and shows the adjusting and clamping mechanism detail; and

FIG. 5 is a sectional view on a further enlarged scale of the clamp parts illustrating certain features of the construction.

In FIG. 1 there is shown a body 10 for a vehicle such as a truck or aircraft in which various articles of cargo 11 may be secured in position by the strap securing device incorporating strap member 12, anchor terminal 13 and length adjustment terminal 14. The details of construction of the securing apparatus are more clearly illustrated in FIGS. 2 to 4 inclusive where it will be seen that the strap member 12 has considerable width and may be made of heavy woven material to provide strength and flexibility while at the same time affording protection against damage to articles against which it is applied during their transportation. Terminal 13 may be made in the form of a hook having a spring loaded keeper 15 to permit attachment to a ring or other anchoring device. From FIG. 3 it will be observed that anchor fitting 13 has a frame preferably made from two side plates 16 with a spreader bar 17 at one end. Bar 17 engages the strap 12 which passes around it and is sewn or otherwise suitably attached to the terminal to provide a secure connection for the transfer of the full load carried by the strap. The other end of the side plates 16 are formed into a hook shape and brought together and fastened to form a single member, rivets 18 being suitable for this purpose.

The adjusting and load transfer unit 14 may also be made in the form of a hook type terminal to permit ready engagement with an anchor fitting to which the securing load is to be transferred. Unit 14 may be constructed in the form of a frame using side plates 19 which also are brought together at one end to form a hook member while at the other end are spread a distance greater than the width of the strap member 12 to support the strap anchoring parts. From FIG. 4 it will be seen that plates 19 are located by means of spreader rods 20 and 21. Also a heavy transverse beam member 22 is supported in plates 19 near one edge. These members 20, 21 and 22 are provided with shoulders and trunnions, or reduced portions such as illustrated at 23 in FIG. 3 to permit them to project into corresponding holes in the side plates after which they are staked or riveted to maintain them in position. A cam member 24 has a pair of trunnions 25, one at each end, for supporting cam 24 pivotally in side plates 19. One end 26 of cam part 24 is located close to anchor beam 22, being spaced therefrom a distance approximating the thickness of strap 12 which is adapted to be passed between cam 24 and beam 22 and then around the opposite edge 27 of cam 24 and between the guide rods 21. The tension or pull of the load in the strap is in the direction of arrow 12*a*, FIG. 4. It will be noted that the strap forms an obtuse angle with the external extension of axis 24*a* of the cam element 24. This geometrical relationship assures that as the cam moves on its pivot under load the clamping moment developed will increase due to the increase in effective arm length. The guides 21 assure that the direction of pull of the strap at the end of the cam is retained in the correct position in spite of external application influences, thereby giving reliable clamping operation under all conditions.

The handle release member 28 has a pair of lugs 29 which are spaced to lie directly inside the plates 19 and engage the ends of the cam member 24 just outside the strap member 12. A slot is provided in lug 29 to engage the pivot member 25 and a pin 30 completes the attachment of each lug 29 to the end of cam 24. Thus pressure applied to the plate portion of release handle or latch 28 will cause rotation of the cam member in a direction to cause release of the clamping action. Full release position is reached when the release member 28 engages rod 20 which thus acts as a stop to limit the position of the cam in the release direction. Since the release member 28 always lies entirely between the frame plates 19 under strap clamping conditions, there is minimum danger of accidental release of the clamped strap and its load.

From FIG. 5 the action of the clamping cam will be more clearly observed. Rotation of the cam **24** about the pivot **25** in the direction of arrow **31** causes the eccentric end **26** of the cam to move closer to the beam **22** thereby reducing the space between them. Tension on the strap accentuates clamping action and provides an even pressure on the fibers of the strap over a considerable area so that excessive concentration of load and damage is avoided. At the pressure portion of said eccentric end **26** of the cam **24** there is a slight extension **26***a* which assures the spread of the pressure over a considerable area when in clamped position. In addition the small smooth edged grooves **26***b* along the surface of the cam in the loaded region provide for increased holding action at lower pressure on the strap. Rotation of the cam **24** in the direction opposite to arrow **31** moves the eccentric portion **26** away from beam **22** until the completely released position is reached when the flat portion **32** of the cam lies substantially parallel to the surface of beam **22**. In this position, shown in dotted outline **28***a*, FIG. 4, the space between the two clamping members is a maximum and provides adequate clearance to allow unrestricted movement of the strap for easy adjustment to the desired length.

Before applying the strap to a load it is extended to a length greater than that required for attachment in its secured position. This is accomplished by depressing the release handle **28** to release position thereby permitting the strap to be freely drawn out to the desired length. The anchor **13** is then connected to a suitable securing point and then the anchor **14** is hooked into position. The free end of the strap is then grasped and tension applied to it until the slack has all been removed from the strap. The desired degree of tension is secured by applying an initial load by pulling on the free end of the strap. It will be noted that this action results in a pull being applied to both anchor members with the result that all slack is removed. In view of the shape and action of the eccentric member, clamping action occurs with substantially no back motion thereby maintaining the initial tension. Any further load produced in the strap due to the motion of the cargo serves to increase the clamping action in a positive and direct manner due to the fact that the strap load is applied directly to the clamping unit. Release of the load is readily accomplished by depressing the release latch **28** and pulling on the loaded side of strap **12** to extend it sufficiently to allow the unhooking of the anchor terminals **13** and **14**.

From the foregoing description it will be evident that I have provided an improved construction for strap clamping and adjusting devices. Through the cam unit construction of the present invention the strap load not only causes direct actuation of the clamp to assure non-slipping characteristics but also the eccentric unit itself provides the direct load transfer structural medium between the strap and the frame unit. The particular proportioning of the cam member provides for a positive increase of clamping action due to load increase and also due to the increase in effective moment arm which results from the relationship of the cam part with respect to the strap pull. The arrangement of the release handle provides a protected location for this member to prevent accidental operation while at the same time it can be easily reached for release purposes either for initial length adjustment or for release of the load. The construction of the clamping mechanism of the present invention provides for greatly reduced length of equipment to provide the load transfer between the strap and the frame. Use of the adjusting frame as a hook member to also provide for anchoring further enhances the compactness of the apparatus.

This application is a continuation-in-part of abandoned application Serial No. 343,965, filed March 23, 1953.

I claim:

Securing apparatus having a strap member, an adjusting and load transfer device mounted on said strap member including a frame structure having side plates at each edge of the strap member, a clamp beam supported at each end in said frame structure, a clamp part having a pivot support in said frame structure, said clamp part having a strap engaging surface adjacent said clamp beam which surface is eccentric with respect to said pivot support and cooperative with said clamp beam to provide clamping action, a handle connected to the ends of said clamp part between said frame plates and defining a passage with said clamp part whereby said handle and clamp part lie on opposite sides of said strap, a stop attached to said frame structure located to limit the rotation of said clamp part in the release direction to a small angular motion just sufficient to allow free movement of the strap member, said strap member extending through said passage approximately 180 degrees with respect to said pivot support around said clamp part from the loaded portion of the strap to the clamping point defined by said clamp beam and clamp part, said clamp part having a portion remote from said clamp beam extending in a generally transverse direction with respect to said strap member and defining an acute angle with the loaded end of said strap member whereby rotational movement of said clamp part in the loaded direction produces an increase in clamping moment, said frame plates extending beyond said handle in all directions under strap clamping conditions.

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