May 16, 1967 L. L. RUDOLF 3,319,786

CLAMP-RAIL CONNECTOR

Filed Aug. 29, 1963

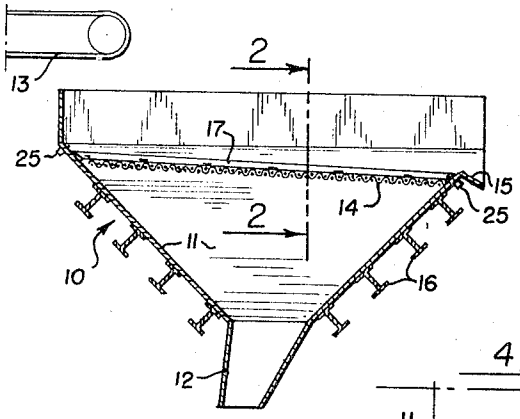


Fig. 1

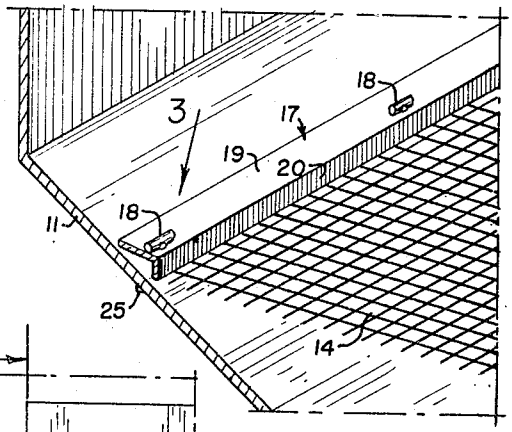


Fig. 2

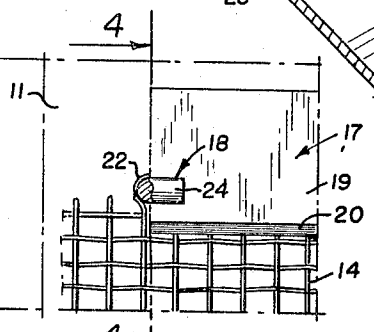


Fig. 3

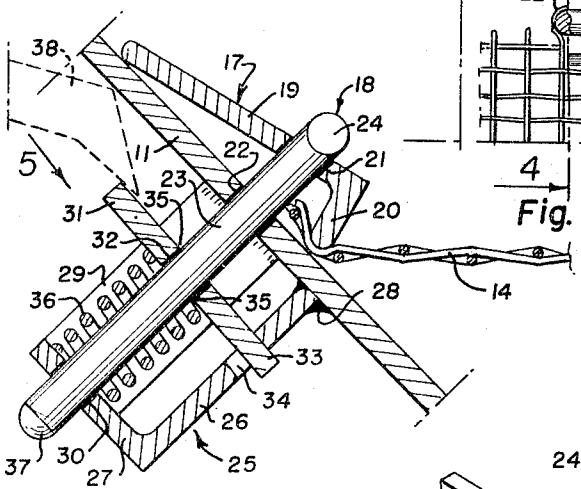


Fig. 4

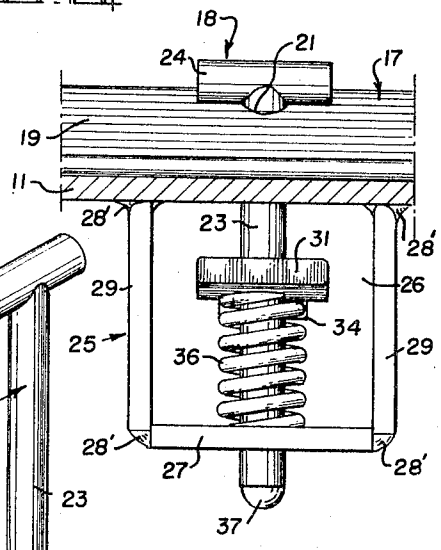


Fig. 5

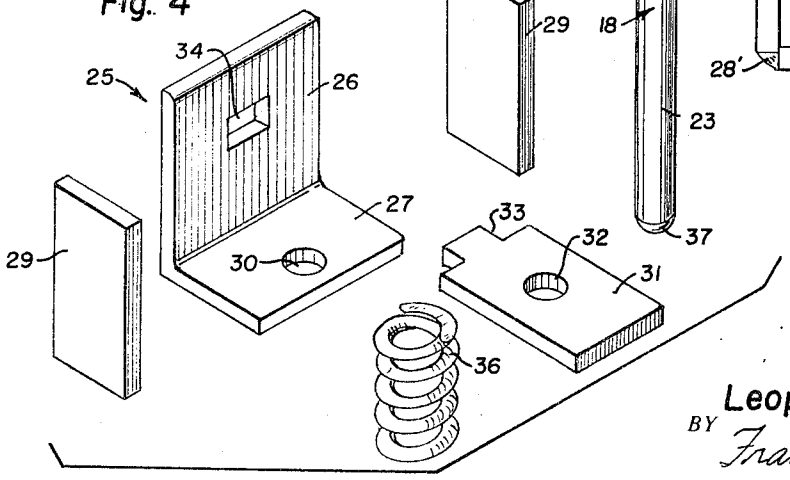


Fig. 6

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CLAMP-RAIL CONNECTOR

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1 Claim. (Cl. 209—414)

This invention relates to connectors for clamp rails of the type which are for holding screens over commonly used hoppers, aggregate vibrators, sorters, and the like. Accordingly, the invention will be described as a clamp-rail connector.

The main purpose and a primary object of the invention is to provide a novel and improved clamp-rail connector for holding a screen over a hopper or similar construction, which will automatically lock the clamp rail in place over the edge of a screen without requiring subsequent fitting and tightening of lock nuts when it is being placed.

Hoppers of all sorts are used in the handling of granulated and particulate materials, for the primary function of a funnel-shaped hopper is to receive batches of such material and to discharge the material as it is needed and usually at a regular flow rate. In handling ore or gravel, a hopper will often include a screen across its top so that it may classify the material, for only particles of a selected size will drop into the hopper. Such screens are usually heavy and comparatively rugged in order to withstand substantial loads which may be placed on them. Often they are severely treated, and it is essential that these screens be not only strong, but also that they be tightly secured against the walls of the hopper. Strong and heavy connecting rails which are tightly connected to the walls of the hopper are required for this purpose.

Often the screens must be replaced because of wear or because of the need to change their size. Such changing operations can become very expensive primarily because of the time consumed in removing and replacing the connecting bolts which hold and secure the clamp rails in place. There is a real and definite need for an improved arrangement of holding screens in a hopper and especially for a quicker arrangement which provides for connecting and disconnecting of the clamp rails from the walls of a hopper.

The present invention was conceived and developed with such a need in view and the invention comprises, in essence, a self-locking connector which is affixed to the under surface of the wall of the hopper and is adapted to receive and automatically grip the shank of a connecting pin or bolt passing through a screen rail and the wall of the hopper.

It follows that another object of the invention is to provide a novel and improved connector for a clamp rail for holding a screen in a hopper, or the like, which is adapted to permit the clamp rail to be quickly and securely fastened to the wall of the hopper.

Another object of the invention is to provide a novel and improved connector for the clamp rail for holding a screen in a hopper, which is further adapted to permit the clamp rail to be quickly and easily loosened so as to permit the screen to be removed from the hopper without delay.

Another object of the invention is to provide a novel and improved clamp-rail connector which is especially adapted to grip and hold the shank of a connecting pin passing through the clamp rail and through the wall of a hopper whereon the rail is mounted, and which may be further tightened and secured into place by simply striking the head of the pin as with a hammer.

Another object of the invention is to provide a novel and improved connector for securing a clamp rail over a screen in a hopper which permits all adjusting and

tightening operations to be completed by a single man within a hopper and without requiring him to repeatedly enter and leave the hopper as for adjustments at the outer wall of the hopper and which further, permits all releasing operations, to remove the screen to be quickly and easily completed by a single man outside the hopper and without requiring him to enter the hopper until all of the rails are loosened from the hopper walls.

Further objects of the invention are to provide an improved clamp-rail connector for a hopper and the like which is a simple, low-cost, easily-installed, neat-appearing, rugged and durable unit.

With the foregoing and other objects in view, all of which more fully hereinafter appear, my invention comprises certain constructions, combinations, and arrangements of parts and elements as hereinafter described, defined in the appended claim and illustrated in preferred embodiment in the accompanying drawing, in which:

FIGURE 1 is a sectional elevational view, somewhat diagrammatic in nature, of a typical hopper having the top thereof covered by a screen.

FIGURE 2 is a fragmentary, isometric, sectional view of a portion of the hopper illustrated at FIG. 1, as taken substantially from the indicated line 2—2 at FIG. 1, but on an enlarged scale.

FIGURE 3 is a fragmentary plan view of a portion of the structure illustrated at FIG. 2 as taken from the indicated arrow 3 at FIG. 2, but on an enlarged scale and with certain portions being broken away to show parts otherwise hidden from view.

FIGURE 4 is a fragmentary, sectional detail of the hopper wall, screen, holding rail, and a sectional view of the improved connector, as taken from the indicated line 4—4 at FIG. 3, but on an enlarged scale.

FIGURE 5 is a sectional view of a fragment of the hopper and an end view of the improved connector and clamp rail on the hopper as taken from the indicated arrow 5 at FIG. 4.

FIGURE 6 is an exploded, isometric, view of the elements constituting the improved connector per se and the connecting pin associated therewith.

Referring more particularly to the drawing, FIG. 1 represents a portion of a typical hopper **10**, which is shown as a funnel-like container, rectangular in plan, with the sloping walls **11** converging to a chute **12** at its base. Particulate material may be supplied to such a hopper in any manner and preferably in a continuous manner as from a belt conveyor, **13** or the like, whenever a screen is used. Where the material which is being deposited into the hopper must be classified, as to size, the upper mouth of the hopper is ordinarily covered by a screen **14**. This screen may be sloped, the hopper vibrated, or any other means may be used to move the rejected oversize material across the screen and permit it to be discharged as from a lip **15** at one side of the hopper. A similar construction may be used in vibrators, sorters, and other types of equipment which carry screens for sorting purposes and while the invention is described with reference to a hopper, it is to be understood that such description is not intended to be restrictive.

In larger hoppers which handle heavy loads of ore and gravel, the walls **11** are usually steel plates, reinforced by exterior supporting beams **16** and this rigid structure provides a base for securing the screen to it without special reinforcing members adjacent to the screen connection. The screen **14** is of heavy steel wire of any selected size and woven to any selected mesh. For example, the screen may be of wire as heavy as 10-gauge size and attached to the walls **11** of the hopper by clamp rails **17** which in turn are affixed to the walls **11** of the hopper by a spaced array of bolts in a conventional construction or pins **18** in the improved construction, as will be hereinafter de-

scribed. These clamp rails may be formed as angle members having uneven legs. The wider leg of a rail may form the top surface **19** of the rail and the narrower leg may form the gripping edge **20** thereof, which grips the wires of the screen **14**.

In conventional constructions, a spaced array of bolts secure these rails to the walls of the hopper, and the bolts extend through suitable holes **21** in the top surfaces **19** of the rails and thence into holes **22** in the walls **11** of the hopper. Thence, the bolts are held by nuts and washers, not shown, at the outer side of the walls **11**. It is immediately manifest that the problems of aligning, threading, securing, and tightening these rail members with bolts is time consuming, awkward, and expensive.

In the present invention, the above described conventional arrangement is modified by using pins **18** which are characterized by having a smooth shank **23** and preferably, but not necessarily, a T-shaped head **24**. Such pins may thus be contrasted with the construction of conventional threaded bolts, although it is to be understood that conventional bolts may be modified to serve as such pins. Each pin **18** is held by a simplified construction of a gripping connector **25** which is mounted at the underside, or the outer side, of a hopper wall **11** beneath each of the bolt holes **22** which are necessary to hold the clamp rails in place. Each connector **25** is adapted to receive the smooth shanks **23** to permit movement thereinto but to tightly grip and hold the same against withdrawing movement.

The frame of each connector **25** is formed generally as a box-like enclosure secured to the under face of a hopper wall **11** as by welding. A back wall section **26** and an end section **27** of this connector frame are formed by a short structural angle member having its legs of lengths suitable to form the sections **26** and **27**. The back wall section **26** stands from the wall **11** and its edge is welded or is otherwise secured to the hopper wall **11** as at **28** and the end section **27** thus lies in spaced parallelism with the wall **11** surface. This box-like frame is completed by side wall reinforcing sections **29** which outstand from the wall **11** at each side of this angle member to be affixed to the walls and also to the sides of the end section **27** as by welds **28'**.

A hole **30** in the end section **27** lies in axial alignment with the hole **22** in wall **11** so that when a pin **18** is aligned in a hole **21**, in a rail **17**, and in its corresponding hole **22** in the wall **11**, it will also be in alignment with and extend through the hole **30** in the end section, the length of the shank **23** being sufficient for that purpose.

A flat, rectangular lock plate **31** is mounted within this connector frame and it includes a centered hole **32** which also lies in axial alignment with the holes **30** and **22** when the plate is positioned in the frame of the connector **25** in spaced parallelism with the wall **11** and the end section **27**. In that position, a pin **18** may also pass through the hole **32** in this lock plate. One end of the lock plate **31** is formed with a short extended tongue **33** which is adapted to lie in a slot **34** in the back wall section **26** of the connector frame.

The size of the hole **32** is such as to provide a substantially snug fit with the shank **23** of pin **18** and to permit the pin **18** to easily pass therethrough when this lock plate **31** is in spaced parallelism with wall **11** and end plate **27**, and is normal to the axis of the pin **18**. However, whenever the lock plate is tilted by pivoting it at the tongue **33**, in slot **34**, the edges of the hole **32** will grip the sides of the bolt with a comparatively tight gripping fit as at points **35**, as indicated at FIG. 4.

Whenever the pin is extended into the connector frame through the holes **21**, **22**, **35**, and **30** to extend beyond the end of the frame, and to its full depth to hold the clamp rail **17** against the wall, and the lock plate is then tipped towards the wall to its fullest possible extent, it becomes manifest that the gripping action at points **35** against the shank of the bolt will prevent the bolt from being withdrawn from this hole. To produce a positive locking effect by such movement of the lock plate **31**, a spring **36** is mounted about the shank of the pin **18** between the end section **27** of the frame and the lock plate **31** to thereby tilt and urge the lock plate towards the wall **11**. With this arrangement, using a fairly strong spring, any movement of the pin **18** into the frame of the connector as to tighten the clamp rail onto the wall **11**, will permit the shank **23** of the pin **18** to slip past the lock plate, but any reverse movement of the pin will be prevented.

When using this simplified connector **25** to secure a clamp rail against the wall of the hopper and to hold a screen **14** stretched thereunder, it is merely necessary to place the clamp rail and screen in position with holes **21** in the clamp rail in alignment with holes **22** in the wall **11** and then to drive the pins **18** through the holes **21** in the rails, through the holes **22** in the wall **11** of the hopper, thence through the holes **32** in the lock plates and finally through the holes **30** in the ends **27** of the connector frames **15**. Each pin **18** may be driven therein by a hammer with the final blows actually pulling the clamp rails **17** against the wall of the hopper to thereby tightly grip the screen **14**. To facilitate driving the pins through these several holes, and especially through the lock plate holes **32**, the ends of the pin shanks may be rounded as at **37**.

The speed with which the clamp rails may be secured into place by these improved connectors is apparent. Also, the ease and speed with which they may be removed is advantageous. All that is required is to lift the extended ends of the clamping plates as with a pry bar **38**, as in the manner illustrated at FIG. 4, in broken lines. It is necessary to merely lift a plate **31** slightly towards its neutral position in spaced parallelism in the hopper wall **11** and the pin **18** therein will be free to slide out of the connector **25**.

Several modifications may be used in this arrangement. As aforestated, conventional bolts may be used instead of the pins **18**. Also, by using longer pins, the connector frames **25** may be secured, not to the inner wall **11** of the hopper, but to other frame members holding the hopper walls in place.

I have now described my invention in considerable detail, however, it is obvious that others skilled in the art can build and devise alternate and equivalent constructions which are nevertheless within the spirit and scope of my invention. Hence, I desire that my protection be limited, not by the constructions illustrated and described, but only by the proper scope of the appended claim.

I claim:

A friction-lock, clamp-rail connector for holding a clamp rail against the face of a hopper to secure the edge of a screen or the like, wherein the clamp rail is formed generally as an angle bar with one leg substantially shorter than the other and with the end edge only of the short leg in direct contact with a screen or the like for gripping said screen or the like between the clamp rail and hopper wall and wherein the clamp rail and hopper wall includes aligned holes through each member and comprising, in combination therewith, a headed pin having a smooth shank adapted to be extended through a set of aligned holes in the clamp rail and in the wall of the hopper to bring the head of the pin against the clamp rail surface, a box-like framework outstanding from the opposite side of the wall of the hopper, said box-like framework including a member having a first leg welded to the underside of the hopper and having a slot therein, a second shorter leg extending at right angles to said first leg, and a pair of parallel legs extending from said second leg and rigidly secured to said hopper and said second leg, a lock plate having a tongue at one end inserted in said slot so as to be swingably mounted within this framework and having an orifice therein through which the shank of the pin passes, said lock plate being shiftable from the normal position perpendicular to the bolt to an inclined, locking position towards the hopper wall, with respect to the bolt

and with the orifice therethrough being sized to permit free movement of the shank therein when in said normal position but to wedgingly lock against the shank when tilted to said locking position, and means within the framework adapted to urge the lock plate toward the wall of the hopper to said locking position and out of said normal position, whereby movement of the pin into the lock rail and through the wall of the hopper to tighten the grip of the rail upon the hopper is accompanied with movement of the pin tending to push the lock plate towards its normal position whereby to permit the pin to move therethrough, but opposite retracting movement of the pin is prevented by the lock plate gripping the shank of the pin.

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