

[54] LATCH AND V BAND COUPLER

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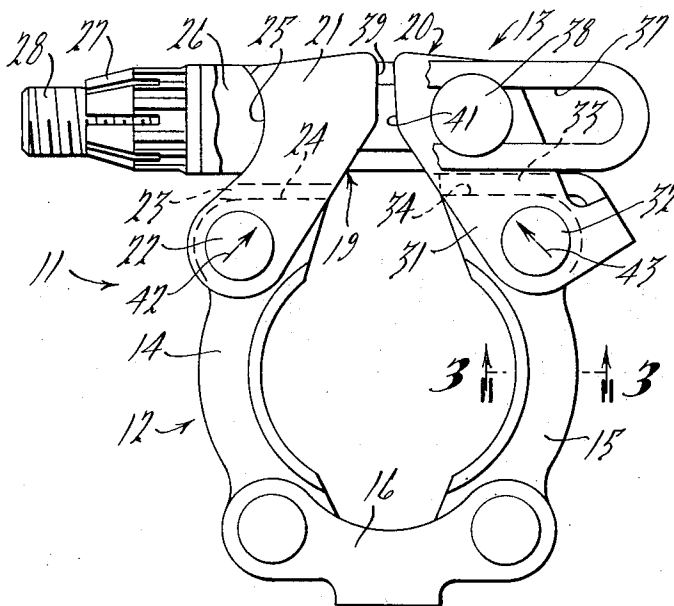
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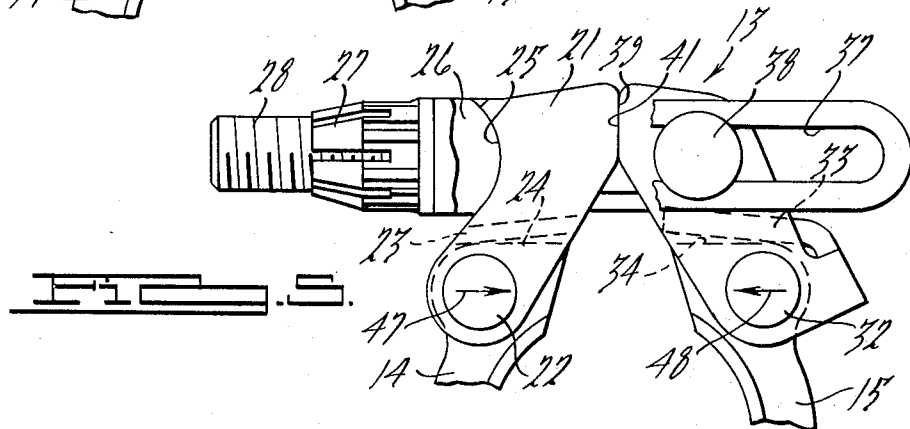
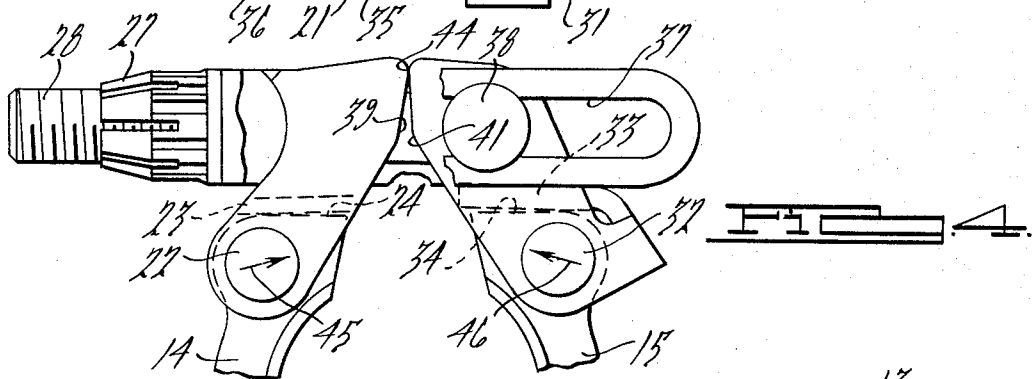
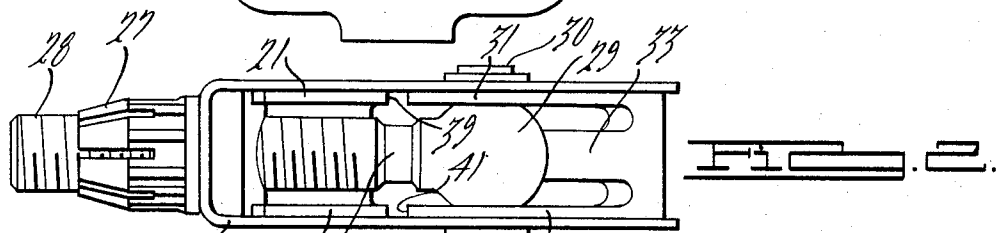
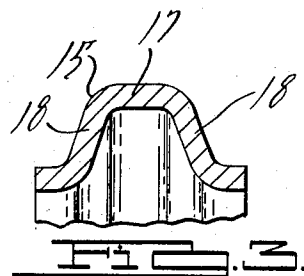
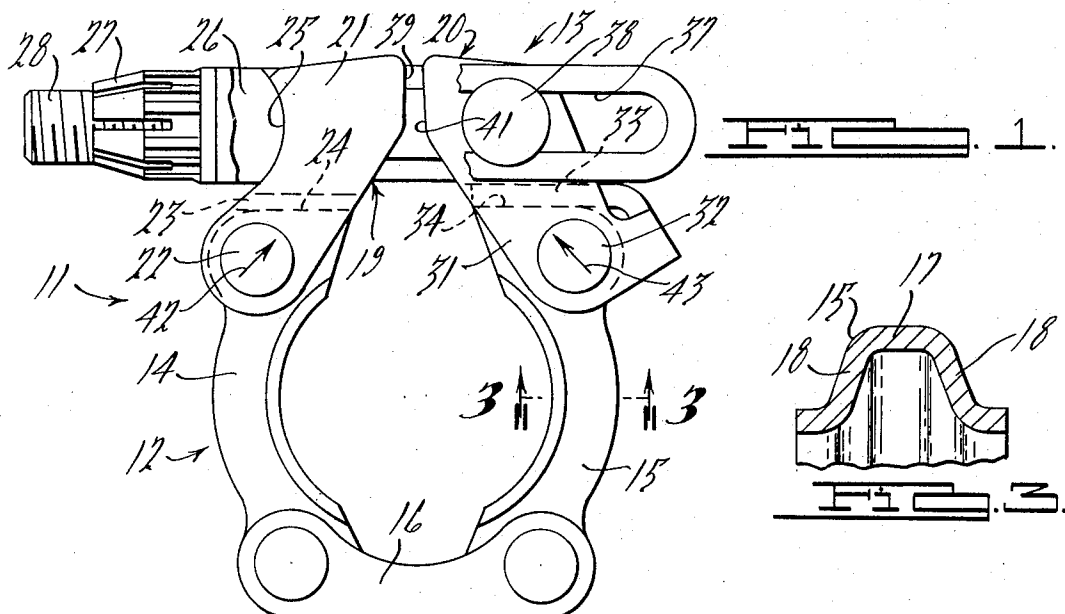
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[57] ABSTRACT

A "V" band coupler having arcuate segments pivoted to a bottom hinge with a latch mechanism connecting the upper segment ends. The latch mechanism comprises two sections each having a web and a pair of flanges pivoted to the upper ends of the coupler segments. The head of a bolt is pivoted to one latch section and extends through the web of the other, a nut on the bolt drawing the latch sections together when tightened. Bridges on the latch sections initially engage the segments so as to create angular closing forces thereon. However, the latch sections have facing edges which contact above the bolt centerline, changing the pulling angle on the segments until it is parallel to the bolt axis. Any overtorque is taken up in the latch, protecting the segments.

7 Claims, 5 Drawing Figures





LATCH AND V BAND COUPLER

BACKGROUND OF THE INVENTION

The invention relates to latch mechanisms which may be used with couplers of the "V" band type having arcuate segments connected at their lower ends by a hinge and capable of drawing together ducts or other members having abutting flared flanges. A problem which exists with present day constructions of this general type is that the forces are exerted by the latch mechanism on the coupling segments in directions of lesser segment strength. This may cause failure of these segments upon overtightening of the latch mechanism. Conventional latch mechanisms for such couplers are also quite expensive to manufacture.

BRIEF SUMMARY OF THE INVENTION

It is an object of the present invention to provide a novel and improved latch mechanism for a segmented coupler which allows large installation torques to be applied without overstressing these segments.

It is another object to provide a novel and improved latch mechanism of this nature which can be constructed to carry a predetermined capacity at substantially lower cost than conventional latch mechanisms of this general type.

It is another object to provide an improved latch and coupler mechanism which allows a non-catastrophic failure mode in that during and after failure of the coupler maintains a semi-closed position, preventing complete separation of the ducting or other clamped parts.

Briefly, the illustrated embodiment of the invention comprises a coupler having facing arcuate segments pivoted to a hinge at the bottom, and a latch mechanism for drawing together the tops of said segments. The latch mechanism comprises two latch sections pivoted to said segments, a bolt having a head pivoted to one section and passing through the other section, a nut on said bolt, means responsive to rotation of said nut for drawing together said segments, bridges on said latch sections engageable with tops of said segments during initial tightening of the nut to create a combined rotational and direct pulling force on the segments, and facing edges on the segments so shaped that continued tightening of the nut will cause the edges to contact each other above the bolt axis, whereby the sections will pivot about the contacting point to shift the direction of pulling forces on the segments toward alignment with the bolt axis.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of a coupler and latch mechanism constructed in accordance with the invention, shown before tightening with the latch section bridges engaging the coupler segments.

FIG. 2 is a top plan view of the latch and coupler.

FIG. 3 is a detailed cross-sectional view taken along the line 3—3 of FIG. 1 to show the coupler segment construction.

FIG. 4 is a fragmentary side elevational view showing the latch mechanism just prior to reaching the proper closing torque, with the latch sections in contact and the pivot bridges lifting off the segments.

FIG. 5 is a fragmentary side elevational view similar to FIG. 4 but showing the contact position of the latch

sections at the assembled position with the pivot bridges lifted off the segments.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The assembly is generally indicated at 11 and comprises a "V" band coupler generally indicated at 12 and a latch mechanism generally indicated at 13. The coupler is by itself of conventional construction, having a pair of arcuate segments 14 and 15 pivoted to opposite ends of a hinge 16. The cross-sectional shape of each segment is shown in FIG. 3, comprising a web portion 17 and diverging flanges 18 which serve to draw together complementary flanges (not shown) of aligned ducts or other members to be secured.

Latch mechanism 13 comprises a pair of latch sections generally indicated at 19 and 20 pivotally connected to segments 14 and 15 respectively. Section 19 has a pair of side flanges 21 the lower ends of which are connected to segment 14 by a pivot pin 22, a bridge 23 connecting intermediate portions of these side flanges. This bridge is engageable with the flat upper edge 24 of segment 14 as seen in FIG. 1, but is swingable away from such contact to the positions shown in FIGS. 4 and 5.

The outwardly facing edges 25 of flanges 21 are of concave shape to accommodate the complementary surface of a spacer 26. The spacer transmits forces to latch section 19 from a nut 27 mounted on a bolt 28. This bolt passes through the flanges 21 of latch section 19 and its head 29 is pivoted at 30 between the flanges 31 of latch section 20.

The latter section is shaped similarly to latch section 19 in that the lower ends of flanges 31 are pivoted at 32 to the upper end of coupler segment 15. Section 20 has a bridge 33, an intermediate portion thereof being engageable with the upper flat surface 34 of segment 15 when in the position of FIG. 1. As in the case of bridge 23, bridge 33 can be swung away from contact with surface 34 to the positions shown in FIGS. 4 and 5.

Bolt 28 is provided with a necked-down portion 35 (FIG. 2) which will rupture when excessive torque is placed on nut 27. Means are provided for preventing complete separation of the ducting or other clamped parts when this occurs. A U-shaped cage 36 has its central portion disposed between nut 27 and spacer 26, and its legs extending along opposite sides of the latch mechanism. These legs have guide slots 37 which are retained by enlarged portions 38 on pivot 30. Thus, upon rupture of the bolt the latch mechanism will open only until pivot 30 reaches the ends of slots 37, maintaining the coupler in a semi-closed position.

The latch pivot means is so arranged as to allow large installation torques to be applied without overstressing coupler segments 14 and 15. This is done by changing the loading mode acting on the segments as torque is increased on nut 27, from a combined rotary and translatory force to a direct translatory force parallel to the bolt axis. This avoids overstressing the coupler segment ends and permits a lighter construction for any predetermined load requirements.

The means for accomplishing this comprises the facing pairs of straight edges 39 and 41 of latch sections 19 and 20 respectively, together with the relative positions of bridges 23 and 33. The construction is such that during initial tightening of nut 27, as shown in FIG.

1, bridges 23 and 33 will be supported by surfaces 24 and 34 respectively of the segments. As a result, the forces exerted by the latch sections on the coupler segments will be in the directions of arrows 42 and 43. These forces are the resultant of the tendency of the latch sections to rotate about contacting bridges 23 and 33 and the direct pull in the direction of the bolt axis. It will be observed that these forces are being transferred through relatively weak portions of the coupler segments.

Further tightening of nut 27 will cause the upper portions of edges 39 and 41 to come into contact, as shown in FIG. 4. This will be achieved prior to reaching the proper closing torque. Continued tightening of nut 27 will thus cause sections 19 and 20 to pivot about their contact point 44 rather than tending to pivot at bridges 23 and 33. Since point 44 is above the axis of bolt 28, the lower portions of sections 19 and 20 will be drawn together in an axial direction. Bridges 23 and 33 will begin to be lifted off surfaces 24 and 34 respectively, and the directions of the forces acting on segments 14 and 15 will be as indicated by arrows 45 and 46. That is, these forces will become more aligned with the axis of bolt 28. Convex spacer 26 will slide on edges 25 of flanges 21 during this movement to maintain the alignment of bolt 28.

As the proper closing torque is reached, straight edges 39 and 41 will come into full contact with each other as shown in FIG. 5. Bridges 23 and 33 will be lifted off surfaces 23 and 34 respectively and the forces acting on segments 14 and 15 will be as shown by arrows 47 and 48, that is, parallel to the axis of bolt 28. At this time, the forces will be acting on these segments through relatively strong portions thereof, thus protecting the segments against damage.

After fully bottoming against each other straight edges 39 and 41, the lower portions of which are in alignment with the bolt axis, will further protect the segments by allowing no additional torque to be transferred thereto. Any overtorque on nut 27 will be taken up in the latch itself, protecting the segments.

It should be observed that parts of the latch mechanism such as sections 19 and 20 could be fabricated as stampings, thus substantially reducing the cost of manufacture of the assembly.

I claim:

1. In combination, a latch mechanism for drawing two parts together comprising first and second latch sections, each section having a pair of flanges pivoted to one of said parts, each part having a pair of flanges joined by an outer web, each section being pivoted by a pivot pin passing through said section flanges adjacent said web, each section further having a bridge engageable with the top of said part and a pair of straight edges facing the edges of the other latch section, and bolt and nut members interconnecting said latch sections, relative rotation of said members drawing the sections together and causing said bridges to engage the tops of said parts, whereby combined rotary and translatory forces will be exerted by said sections on said parts which will cause said pivot pins to exert an outward force component on said part flanges, continued relative rotation of said members causing said facing pairs of edges to abut each other on the side of the bolt axis opposite said parts, whereby said bridges will be lifted from engagement with said parts to reduce said outward force component and the directions of

forces on said parts will be shifted toward alignment with the bolt axis.

2. The combination according to claim 1, the lower portions of said edges being in alignment with said bolt axis, whereby full engagement of said edges will prevent overtorquing forces from being transmitted to said parts.

3. In combination, a coupler having facing arcuate segments pivoted to a hinge at the bottom, each segment having a pair of flanges joined by an outer web, and a latch mechanism for drawing together the tops of said segments, said latch mechanism comprising two latch sections pivoted to said segments by pivot pins passing through said flanges adjacent said web, a bolt having a head pivoted to one section and passing through the other section, a nut on said bolt, means responsive to rotation of said nut for drawing together said segments, bridges on said latch sections between said bolt and said pivot pins engageable with tops of said segments during initial tightening of the nut to create a combined rotational and direct pulling force on the segments which will cause said pivot pins to exert an outward force component on said segment flanges, and facing edges on the segments so shaped that continued tightening of the nut will cause the edges to contact each other above the bolt axis, whereby the sections will pivot about the contacting point to reduce said outward force component and shift the direction of pulling forces on the segments toward alignment with the bolt axis.

4. The combination according to claim 3, said facing edges being straight whereby the edges will come into complete contact in response to increased torquing of the nut, the lower portions of the facing edges being in alignment with the bolt axis, thus preventing excessive force from being placed on the segments.

5. The combination according to claim 4, said bolt having a necked-down portion subject to rupture upon overtorquing, and a cage interconnecting said latch sections to maintain them in a semi-closed position upon such rupture.

6. In combination, a coupler having facing arcuate segments pivoted to a hinge at the bottom, and a latch mechanism for drawing together the tops of said segments, said latch mechanism comprising two latch sections pivoted to said segments, a bolt having a head pivoted to one section and passing through the other section, a nut on said bolt, means responsive to rotation of said nut for drawing together said segments, bridges on said latch sections engageable with tops of said segments during initial tightening of the nut to create a combined rotational and direct pulling force on the segments, and facing edges on the segments so shaped that continued tightening of the nut will cause the edges to contact each other above the bolt axis, whereby the sections will pivot about the contacting point to shift the direction of pulling forces on the segment toward alignment with the bolt axis, said facing edges being straight whereby the edges will come into complete contact in response to increased torquing of the nut, the lower portions of the facing edges being in alignment with the bolt axis, thus preventing excessive force from being placed on the segments, said pivotal bolt connection having retaining portions engaging said cage, the cage being U-shaped with its central portion mounted on said bolt.

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7. In combination, a pair of "V" band arcuate coupler segments pivoted to a hinge at their bottoms, flat upper surfaces on said arcuate segments; a latch mechanism comprising a pair of latch sections with side flanges, lower portions of said flanges being pivoted to the upper portions of said segments, bridges on said latch sections disposed above said flat segment surfaces, a bolt pivoted to one latch section and extending through the other section, a nut on said bolt, convex spacer means between said nut and other latch section, and facing straight edges on said latch sections, the relative proportions of the parts being such that upon initial nut torquing said bridges will engage said upper

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segment surfaces to provide a combined rotational and direct pulling force on said segments, continued torquing causing the upper portions of said facing edges to contact above the bolt axis whereby the latch sections will pivot about the contact points and bring the forces acting on the segment closer to alignment with the bolt axis while said bridges lift from said segment surfaces, the lower portions of said facing edges being in alignment with the bolt axis whereby full engagement of the facing edges will prevent overtorquing from exerting any further forces on the segments.

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