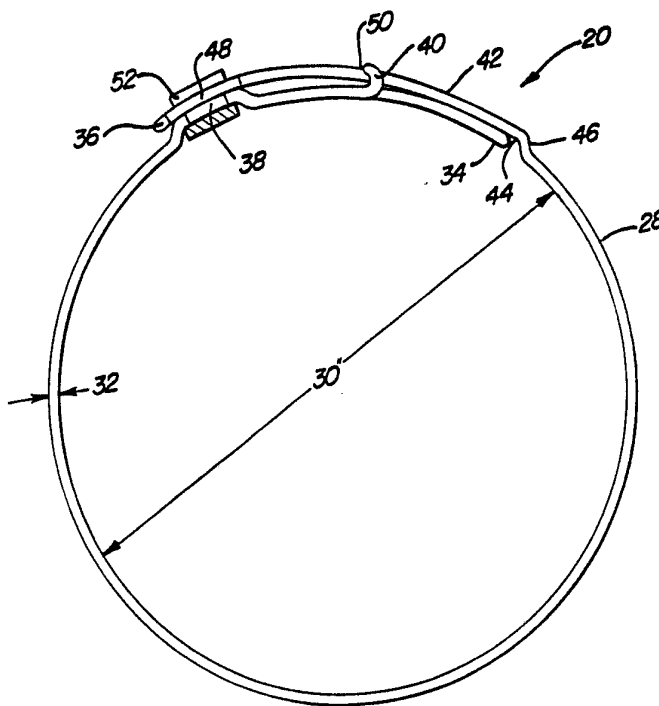




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(21) International Application Number: PCT/US91/04669 (22) International Filing Date: 11 July 1991 (11.07.91) (30) Priority data: 552,247 12 July 1990 (12.07.90) US (71) Applicant: GKN AUTOMOTIVE INC. [US/US]; 3300 • University Drive, Auburn Hills, MI 48326-2362 (US). (72) Inventor: UCHMAN, Frederick, J. ; 9940 Bridge Road, Clarkston, MI 48016 (US). (74) Agent: SCHMIDT, Michael, J.; GKN Automotive Inc., 3300 University Drive, Auburn Hills, MI 48326-2362 (US).		(81) Designated States: AT (European patent), BE (European patent), CA, CH (European patent), DE (European patent), DK (European patent), ES (European patent), FR (European patent), GB (European patent), GR (European patent), IT (European patent), JP, KR, LU (European patent), NL (European patent), SE (European patent). Published <i>With international search report.</i>
(54) Title: LOW PROFILE CLAMP (57) Abstract A clamping device (10) for clamping a hose, boot or the like (12) to a cylindrically-shaped structure (14) is disclosed. The clamping device (10) is a clamping band (20) having a body portion (28), an underlap end (34) having a pair of hooks (40) adjacent thereto, an overlap end (42) having a pair of shoulders (50) adjacent thereto for engaging the pair of hooks (40), and a clasp (52) for binding the overlapped portion of the clamping band (20) adjacent the overlap end (42). The overlap end (42) is elevated above the body portion (28) of the clamping band (20) so as to accommodate the underlap end (34) therebelow. As a result, no gap beneath the clamping band (20) is formed where the overlap end (42) extends radially outward to overlap the underlap end (34). Further, the profile of the clamping band (20) is limited to four thicknesses of the body portion (28) outside the perimeter of the hose or boot (12).		



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1
LOW PROFILE CLAMP

BACKGROUND OF THE INVENTION

1. FIELD OF THE INVENTION

The present invention generally relates to a clamp used to secure
5 hoses, boots or similar structures around a cooperating structure. More
specifically, this invention relates to a low profile clamp which is
particularly adapted to clamp a boot the the hub of a constant velocity
joint having a restricted space within which the clamp must reside and where
the lubricant contained within the boot tends to be forced outward
10 between the boot and the hub due to the high centrifugal forces associated
with a constant velocity joint.

2. DESCRIPTION OF THE PRIOR ART

Clamping devices such as clamping bands are well known in the art and
are extensively used to secure hoses, boots and the like to
15 cylindrically-shaped members. Clamping bands generally include a body
portion having oppositely disposed ends which may or may not overlap each
other, and means for securing the ends or the overlapping portions of the
clamping band together to retain the clamping band on the hose or boot.
Typically the clamping band serves to seal the hose or boot against the
20 cylindrical member to prevent escape of any fluid contained therein, and
further to ensure that the hose or boot is securely retained on the
cylindrical member.

A common problem with clamping bands is the limited space in which the
device must reside. Also, for certain reasons pertaining to mechanical
25 dynamics it may be undesirable for portions of the device to project too far
outside the perimeter of the hose or boot. One approach to limiting these
undesirable consequences is disclosed in U.S. Patent No. 4,802,261 to
Mizukoski et al. There, the opposing free ends and of the band body

overlap each other. Within the region of the overlapping free end there is provided an aperture having a projection extending radially downward toward the overlapped free end. On the overlapped free end is a series of radically upwardly extending projections for cooperating with the
5 projection to retain the band body in a clamping position around a body to be clamped. A pair of bent portions is welded to the underside of the overlapped free end. The bent portions act to maintain engagement between the projection and one of the series of projections. The combined
10 thicknesses of The overlapping and overlapped free ends plus the thickness of the bent portions passing below the overlapped free end and passing above the overlapping free end result in a total of four thicknesses.

A shortcoming of the clamping band disclosed by Mizukoski et al is the radial gap created at the point where the free ends begin to overlap each other. The gap tends to extend along a significant portion of the
15 circumference of the clamp, reducing the clamping effect of the band body on the clamped body 54 in that region. Thus, a path is provided that will allow leakage of fluid contained within the hose or boot if the fluid is under high pressure or if it experiences localized pooling due to internal or external dynamic forces.

20 To avoid this shortcoming, U.S. Patent No. 4,237,584 to Oetiker expressly teaches away from the use of overlapping ends in the design of a clamping band. There, the opposing ends of the clamping band are formed to fit together in a tongue-and-fork fashion. The method of maintaining a clamping action is accomplished by providing a clamping member to the
25 clamping band. The clamping member has a series of teeth which engage a series of cut-out portions that are disposed adjacent each end of the clamping band. What is commonly referred to as an "Oetiker ear" is centrally disposed on the clamping member between sets of teeth.

To draw the clamping band tight around the member to be clamped, the ear is contracted to draw the series of teeth toward the ear, pulling the ends of the clamping band together.

A primary disadvantage to the Oetiker clamping band is the
5 projection of the ear above the perimeter of the clamping band. In applications where space is at a premium or where adverse effects may result from a non-symmetrical construction, the ear presents a major shortcoming.

From the above discussion, it can be readily appreciated that the
10 prior art does not teach a clamping band which simultaneously minimizes the gap created by the overlapping ends of the band while providing a low profile.

Therefore, it would be desirable to provide a clamping band with the advantages of a clamping band having overlapping ends because of its
15 ability to provide a low profile. It would be additionally desirable to provide a clamping band which simultaneously minimizes any gap created by the overlapping ends. As taught by Oetiker, it is not economically feasible to minimize the gap created by overlapping ends by grinding the overlapped end to be thinner because of the added costs of the grinding
20 step and the undesirable compromises required in selecting a band material that can be readily ground.

Accordingly, what is needed is a clamping band which employs overlapping ends thereby facilitating a low profile of the clamping band, while also providing unique features that minimize the gap created by the
25 overlap.

SUMMARY OF THE INVENTION

According to the present invention there is provided a clamping system having a member, such as a boot, which is to be clamped to a cylindrically-shaped surface, such as the hub of a constant velocity

joint, and a clamping band for clamping the boot around the hub. The
clamping band has a body portion, a cooperating pair of features for hooking
overlapping portions of the clamping band as it overlaps itself, and a clasp
for binding another pair of overlapping portions of the
5 clamping band.

In practice, the body portion circumscribes the boot, thereby defining
a diameter. The body portion has an underlap end and an oppositely disposed
overlap end. Adjacent the underlap end is a first clasp segment. The first
clasp segment is radially elevated above the diameter defined by the body
10 portion as it circumscribes the boot. One of the cooperating pair of
hooking features is positioned adjacent the first clasp segment.

Adjacent the overlap end is an overlap segment. The overlap segment is
radially elevated above the diameter of the body portion, similar in
manner to the first clasp segment. When the body portion circumscribes the
15 boot, the overlap segment overlaps the oppositely disposed underlap end. A
second clasp segment is disposed on the overlap segment and adjacent the
overlap end such that the second clasp segment overlaps the first clasp
segment, much the same as the overlap end overlaps the underlap end.

Disposed on the overlap segment and adjacent the second clasp segment
20 is the other half of the cooperating pair of hooking features. As the body
portion circumscribes the boot, the cooperating pair of hooking features
engage each other, retaining the body portion on the boot in its
circumscribing position.

The clasp is positioned around the first and second clasp segments as
25 they reside in their overlapping positions. The clasp secures the first and
second clasp segments together, further assisting the cooperating pair of
hooking features in retaining the body portion around the boot. The clasp
also ensures that the cooperating pair of hooking features remain engaged

with one another. In addition, if the first and second clasp segments are positioned such that they reside adjacent the overlap end, the clasp serves to prevent the overlap end from drifting radially outward.

In use, the clamping system minimizes the extent to which the clamping band projects outside the diameter of the boot by way of minimizing the combined thickness of the clamping band where its members overlap each other. For example, where the overlap and underlap ends overlap each other, the combined thickness is two thicknesses of the body portion. At the clamping band's thickest point where the clasp secures the first and second clasp segments, the combined thickness is no more than four thicknesses - the thickness of the clasp which passes below the first (elevated) clasp segment, plus the combined thickness of the first and second clasp segments as they overlap each other, plus any additional thickness resulting from the clasp passing over the second clasp segment.

According to a preferred aspect of this invention, an inventive feature is that, when the clamping band is specially sized for its particular application, the irregularities, or gaps, along the surface of the clamping band against the boot are minimized. The underlap end lies entirely under the elevated overlap segment of the overlap end. As a result, the possibility is reduced that the lubricant contained within the boot will leak between the boot and hub due to high internal boot pressures or, by example, the high centrifugal forces experienced by the constant velocity joint.

In addition, a significant advantage of the present invention is that the clamping band more readily fits within the restricted confines of a constant velocity joint.

Accordingly, it is an object of the present invention to provide a clamping system having a low profile for allowing the clamping system to fit within a restricted space.

It is a further object of this invention that such clamping system minimize the irregularities of the clamping band surface adjacent to the member it is intended to clamp to ensure the integrity and reliable seal between the member to be clamped and the structure to be clamped thereto.

5 It is still a further object of this invention that there is provided means for securing overlapping portions of the clamping band together for purposes of retaining the clamping band in place around the member to be clamped.

It is yet another object of this invention that there is provided a
10 method for clasping a second pair of overlapping portions together to further ensure the clamping band is retained around the member to be clamped, the clamping band's securing means remain engaged with one another, and further to prevent the radially outward drifting of the overlap end of the clamping band.

15 Other objects and advantages of this invention will be more apparent after a reading of the following detailed description taken in conjunction with the drawings provided.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a partial cross-sectional view of a clamping system in
20 accordance with a preferred embodiment of this invention;

Figure 2 is a cross-sectional view of the clamping system of Figure 1 along line A-A;

Figure 3 is a plan view of the clamping band of Figure 1 in accordance with a preferred embodiment of this invention;

25 Figure 4 is a side view of the clamping band of Figure 3; and

Figure 5 is a cross-sectional view of the clasp of Figure 1 in accordance with a preferred embodiment of this invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

In a preferred embodiment of this invention, as shown in Figure 1 a clamping system 10 is provided which is used to clamp an elastic member, such as a boot 12 having a generally annular cross-section, to a cylindrically-shaped surface, such as that found on a hub 14 of a constant velocity joint. The boot 12 may have one or more annular grooves 16 in the region 18 to be clamped for purposes of better securing the clamping system 10 thereon. The clamping system 10 includes a clamping band 20 which circumscribes the boot 12, and a clasp 22 which binds a pair of adjacent portions of the clamping band 20 together.

Referring to Figures 1 and 2, the clamping band 20 has a body portion 28 adapted to circumscribe the boot 12 in the region 18 intended to be clamped. The body portion 28 defines a diameter 30 as it circumscribes the boot 12. The body portion 28 has a predetermined width no greater than the annular groove 16, and a predetermined thickness 32 which can vary to fit the requirements of a particular application. A common thickness for purposes of the present invention is approximately 0.65 to 0.70 millimeters. The body portion 28 has an underlap end 34 and an oppositely disposed overlap end 36, the underlap end 34 being narrower than predetermined width of the body portion 28.

The clamping band 20 also has a first clasp segment 38 which is adjacent to the underlap end 34. The first clasp segment 38 is formed to be narrower than the predetermined width of the body portion 28 and is also formed such that it is elevated a distance of approximately one predetermined thickness 32 above the body portion 28. This feature, along with the layout and relative elevations of the clamping band 20, can also be readily seen in Figure 3. As a result, the first clasp segment 38 projects outside the diameter 30 by the same distance of approximately one predetermined thickness 32.

A pair of hooks 40 are located between the first clasp segment 38 and the underlap end 34. The hooks 40 are disposed on opposite sides of the predetermined width of the body portion 28, and are generally arcuately formed to radially project a distance of at least one predetermined thickness 32 outside diameter 30.

An overlap segment 42 is disposed on the overlap end 36. The overlap segment 42 is elevated to project a distance of approximately one predetermined thickness 32 outside the diameter 30. In use, the length of the clamping band 20 is such that the overlap segment 42 overlaps the underlap end 34, leaving a minimal gap 44 between the underlap end 34 and a transition portion 46 between the overlap segment 42 and the body portion 28.

A second clasp segment 48 is located on the overlap segment 42 adjacent the overlap end 36. The second clasp segment 48 overlaps the first clasp segment 38 in the same manner that the overlap segment 42 overlaps the underlap end 34. The second clasp segment 48 has a narrower width than the predetermined width of the body portion 28, and is similar in width to the first clasp segment 38.

A pair of shoulders 50 are disposed on the overlap segment 42 adjacent the second clasp segment 48. The pair of shoulders 50 are on opposing sides of the predetermined width similar to the pair of hooks 40 and are formed where the predetermined width of the body portion 28 adjoins the narrower width of the second clasp segment 48. The pair of shoulders 50 cooperate with the pair of hooks 40 to retain the clamping band 20 around the boot 12.

A clasp 52 is crimped to closely fit around both the first clasp segment 38 and second clasp segment 48. The clasp 52 acts to secure the first clasp segment 38 and second clasp segment 48 together, and also

ensures that the pair of hooks 40 and the pair of shoulders 50 remain engaged.

The varying width of the clamping band 20 is more clearly illustrated in Figure 4. As can be seen, the narrower widths of the first and second clasp segments 38 and 48 can be sized such that the width of the clasp 52 when crimped around the first and second clasp segments 38 and 48 never exceeds the predetermined width of the body portion 28, and likewise the width of the annular groove 16.

In addition, Figure 4 shows a breakaway leg 54 extending from the overlap end 36. The breakaway leg 54 facilitates the installation of the clamping band 20 by providing an appendage for gripping the overlap end 36 and holding it in place while the clasp 52 is crimped around the first and second clasp segments 38 and 48. Upon installation of the clasp 52, the breakaway leg 54 can be readily broken free of the overlap end 36 by positioning a stress riser, such as a hole 56, between the breakaway leg 54 and the overlap end 36. As a result, where the first and second clasp segments 38 and 48 are positioned such that they reside adjacent the breakaway leg 54 on the overlap end 36, the clasp 52 serves to prevent the radially outward drifting or deformation of the overlap end 36 of the clamping band 20.

In a preferred embodiment for use when the enclosure space of the clamping system 10 is at a premium, the combined thickness of the clamping band 20 can be minimized. As readily seen in Figure 2, a significant advantage of providing the various overlapping portions of the clamping band 20 is to limit the thickness of the clamping band while maintaining sufficient strength to securely clamp the boot 12 to the hub 14. In the present invention, the combined thickness of the clamping band 20 in the area of the clasp 52 is no more than four predetermined thicknesses 32,

i.e., the thickness of the clasp 52 where it passes below the first clasp segment 38, plus the combined thicknesses of the first and second clasp segments 38 and 48 as they overlap each other, plus any additional thickness resulting from the clasp 52 passing over the second clasp segment 48.

In addition, a significant advantage of the present invention is that the inner surface of the clamping band 20 adjacent the boot 12 has a minimal degree of irregularities. As a result, the possibility is reduced that a lubricant contained within the boot 12 will leak between the boot 12 and the hub 14 due to high internal pressures or high centrifugal forces, such as that experienced by a constant velocity joint.

While the invention has been described in terms of a preferred embodiment, it is apparent that other forms could be adopted by one skilled in the art. An example is providing alternate means for securing the clamping band 20 together, in place of the clasp 52 and the pair of hooks 40 and shoulders 50. Accordingly, the scope of the invention is to be limited only by the following claims.

What is claimed is:

11

- 1 1. A clamping band for clamping a member to a cylindrically-shaped
2 surface, said clamping band comprising:
3 a body portion circumscribing said member, said body portion
4 defining a diameter when circumscribing said member, said body portion
5 having an underlap end and an oppositely disposed overlap end;
6 a first clasp segment adjacent said underlap end, said first
7 clasp segment being radially elevated above said diameter;
8 hook means adjacent said first clasp segment;
9 an overlap segment adjacent said overlap end, said overlap
10 segment being radially elevated above said diameter, said overlap segment
11 overlapping said underlap end;
12 a second clasp segment disposed on said overlap segment and
13 adjacent said overlap end, said second clasp segment overlapping said first
14 clasp segment; capture means disposed on said overlap segment and adjacent
15 said second clasp segment, said capture means engaging said hook means; and
16 clasp means positioned at said first and second clasp
17 segments, said clasp means securing said first and second clasp segments
18 together.
- 1 2. A clamping system as claimed in Claim 1, wherein said body
2 portion has a predetermined width, and said first and second clasp segments
3 and said underlap end each have a narrower width than said predetermined
4 width.
- 1 3. A clamping system as claimed in Claim 2, wherein said capture
2 means comprises a pair of shoulders on opposing sides of said predetermined
3 width, said pair of shoulders being formed where said predetermined width of
4 said body portion adjoins said narrower width of said second clasp segment.
- 1 4. A clamping system as claimed in Claim 2, wherein said hook
2 means comprises a pair of hooks disposed on opposite sides of said narrower

3 width of said underlap end, said pair of hooks being arcuately formed to
4 extend radially outward from said diameter.

1 5. A clamping system as claimed in Claim 1, wherein said clasp
2 means comprises a clasp band which is crimped to closely fit around said
3 first and second clasp segments.

1 6. A clamping band for clamping a member to a cylindrically-shaped
2 surface, said clamping band comprising:

3 a body portion circumscribing said member, said body
4 portion defining a diameter when circumscribing said member, said body
5 portion having a predetermined thickness, said body portion having an
6 underlap end and an oppositely disposed overlap end;

7 a first clasp segment adjacent said underlap end, said
8 first clasp segment being radially elevated above said diameter a distance
9 of one of said predetermined thicknesses;

10 hook means adjacent said first clasp segment;

11 an overlap segment adjacent said overlap end, said overlap
12 segment being radially elevated above said diameter one of said
13 predetermined thicknesses, said overlap segment overlapping said underlap
14 end;

15 a second clasp segment disposed on said overlap segment
16 and adjacent said overlap end, said second clasp segment overlapping said
17 first clasp segment;

18 capture means disposed on said overlap segment and adjacent
19 said second clasp segment, said capture means engaging said hook means; and

20 clasp means positioned at said first and second clasp
21 segments, said clasp means securing said first and second clasp segments
22 together, said clasp means and said first and second clasp segments having a
23 combined thickness of no more than three of said predetermined thicknesses.

1 7. A clamping system as claimed in Claim 6, wherein said body
2 portion has a predetermined width and said first and second clasp segments
3 and said underlap end each have a narrower width than said predetermined
4 width.

1 8. A clamping system as claimed in Claim 7, wherein said capture
2 means comprises a pair of shoulders on opposing sides of said predetermined
3 width, said pair of shoulders being formed where said predetermined width of
4 said body portion adjoins said narrower width of said second clasp segment.

1 9. A clamping system as claimed in Claim 7, wherein said hook
2 means comprises a pair of hooks disposed on opposite sides of said narrower
3 width of said underlap end, said pair of hooks being arcuately formed to
4 extend radially outward from said diameter a distance of at least one of
5 said predetermined thicknesses.

1 10. A clamping system as claimed in Claim 6, wherein said clasp
2 means comprises a clasp band which is crimped to closely fit substantially
3 around said first and second clasp segments, said clasp band and said first
4 and second clasp segments having a combined thickness of approximately four
5 of said predetermined thicknesses.

1 11. A clamping band for clamping a member to a cylindrically-
2 shaped surface, said cylindrically-shaped surface having at least one
3 annular groove, said clamping band comprising:

4 a body portion adapted to circumscribe said member in
5 said region to be clamped, said body portion defining a diameter when
6 circumscribing said member, said body portion having a predetermined width
7 no greater than said at least one annular groove, said body portion having a
8 predetermined thickness, said body portion having an underlap end and an
9 oppositely disposed overlap end, said underlap end being narrower than said
10 predetermined width;

14

11 a first clasp segment adjacent said underlap end, said
12 first clasp segment being narrower than said predetermined width, said first
13 clasp segment being elevated a distance of one of said predetermined
14 thickness above said diameter;
15 a pair of hooks interposed between said first clasp
16 segment and said underlap end, said pair of hooks being disposed on
17 opposite sides of said predetermined width, said pair of hooks being
18 arcuately formed to extend a distance of at least one of said predetermined
19 thicknesses above said diameter;
20 an overlap segment adjacent said overlap end, said overlap segment
21 being elevated a distance of one of said predetermined thicknesses above
22 said diameter, said overlap segment overlapping said
23 underlap end;
24 a second clasp segment disposed on said overlap segment
25 and adjacent said overlap end, said second clasp segment overlapping said
26 first clasp segment, said second clasp segment having a narrower width than
27 said predetermined width;
28 capture means disposed on said overlap segment and adjacent
29 said second clasp segment, said capture means being formed so as to
30 engage said pair of hooks; and
31 clasp means positioned at said first and second clasp
32 segments, said clasp means securing said first and second clasp segments
33 together.

1 12. A clamping system as claimed in Claim 11, wherein said
2 capture means comprises a pair of shoulders on opposing sides of said
3 predetermined width, said pair of shoulders being formed where said
4 predetermined width of said body member adjoins said narrower width of said
5 second clasp segment.

1 13. A clamping system as claimed in Claim 11, wherein said clasp
2 means comprises a clasp band which is crimped to closely fit around said
3 first and second clasp segments.

1 14. A clamping system as claimed in Claim 11, further comprising
2 a breakaway leg extending from said overlap end, said breakaway leg
3 facilitating the tightening of said clamping band around said member to be
4 clamped, said breakaway leg being readily capable of breaking free of said
5 overlap end.

1 15. A clamping band comprising:

2 a body portion, said body portion having an underlap end and
3 an oppositely disposed overlap end;

4 a first clasp segment adjacent said underlap end, said first
5 clasp segment being elevated higher than said body portion;

6 hook means adjacent said first clasp segment;

7 an overlap segment adjacent said overlap end, said overlap
8 segment being elevated higher than said body portion;

9 a second clasp segment disposed on said overlap segment and
10 adjacent said overlap end;

11 capture means disposed on said overlap segment and adjacent
12 said second clasp segment, said capture means adapted for engaging said hook
13 means; and

14 clasp means operatively associated with said first and second
15 clasp segments, said clasp means adapted for securing said first and second
16 clasp segments together when said body portion is arranged to take a
17 circular form and said second clasp segment overlaps said first clasp
18 segment, said overlap segment overlapping said underlap end.

1 16. A clamping band as claimed in Claim 15, wherein said body
2 portion has a predetermined width, and said first and second clasp segments

3 and said underlap end each have a narrower width than said predetermined
4 width.

1 17. A clamping band as claimed in Claim 16, wherein said capture
2 means comprises a pair of shoulders on opposing sides of said predetermined
3 width, said pair of shoulders being formed where said predetermined width of
4 said body member adjoins said narrower width of said second clasp segment.

1 18. A clamping band as claimed in Claim 16, wherein said hook
2 means comprises a pair of hooks disposed on opposite sides of said narrower
3 width of said underlap end, said pair of hooks being arcuately formed to
4 extend higher than said body portion.

1 19. A clamping band as claimed in Claim 15, wherein said clasp
2 means comprises a clasp band which is crimped to closely fit around said
3 first and second clasp segments.

1 20. A clamping band comprising:

2 a body portion, said body portion having a predetermined
3 thickness, said body portion having an underlap end an oppositely
4 disposed overlap end;

5 a first clasp segment adjacent said underlap end, said first
6 clasp segment being elevated a distance of one of said predetermined
7 thicknesses in relation to said body portion;

8 hook means adjacent said first clasp segment;

9 an overlap segment adjacent said overlap end, said overlap
10 segment being elevated a distance of one of said predetermined thicknesses
11 in relation to said body portion;

12 a second clasp segment disposed on said overlap segment and
13 adjacent said overlap end;

14 capture means disposed on said overlap segment and adjacent
15 said second clasp segment, said capture means adapted for engaging said hook
16 means; and

17 a clasp operatively associated with said first and second
18 clasp segments, said clasp securing said first and second clasp segments
19 together when said body portion is arranged to take a circular form and said
20 second clasp segment overlaps said first clasp segment, said overlap segment
21 overlapping said underlap end, said clasp means and said first and second
22 clasp segments having a combined thickness of at least three of said
23 predetermined thicknesses.

1 21. A clamping band as claimed in Claim 20, wherein said body
2 portion has a predetermined width, and said first and second clasp segments
3 and said underlap end each have a narrower width than said predetermined
4 width.

1 22. A clamping band as claimed in Claim 21, wherein said capture
2 means comprises a pair of shoulders on opposing sides of said predetermined
3 width, said pair of shoulders being formed where said predetermined width of
4 said body portion adjoins said narrower width of said second clasp segment.

1 23. A clamping band as claimed in Claim 21, wherein said hook
2 means comprises a pair of hooks disposed on opposite sides of said narrower
3 width of said underlap end, said pair of hooks being arcuately formed to
4 extend higher than said body portion a distance of at least one
5 predetermined thickness.

1 24. A clamping band as claimed in Claim 20, wherein said clasp
2 means comprises a clasp band which is adapted to be crimped to closely fit
3 substantially around said first and second clasp segments, said clasp band
4 and first and second clasp segments having a combined thickness of
5 approximately four of said predetermined thicknesses.

1 25. A clamping band for clamping a member to a cylindrically-
2 shaped surface having at least one annular groove in a region of said
3 member which is to be clamped, said clamping band comprising:

4 a body portion having a¹⁸ length greater than the circumference
5 of said member in said region, said body portion having a predetermined
6 width, said body portion having a predetermined thickness, said body portion
7 having an underlap end and an oppositely disposed overlap end, said underlap
8 end being narrower than said predetermined width;

9 a first clasp segment adjacent said underlap end, said first
10 clasp segment being narrower than said predetermined width, said first clasp
11 segment being elevated a distance of one of said predetermined thicknesses
12 in relation to said body portion;

13 a pair of hooks interposed between said first clasp segment
14 and said underlap end, said pair of hooks being disposed on opposite sides
15 of said predetermined width, said pair of hooks being arcuately formed to
16 extend a distance of at least one of said predetermined thicknesses in
17 relation to said body portion;

18 an overlap segment adjacent said overlap end, said overlap
19 segment being elevated a distance of one of said predetermined thicknesses
20 in relation to said body portion;

21 a second clasp segment disposed on said overlap segment and
22 adjacent said overlap end, said second clasp segment having a narrower width
23 than said predetermined width;

24 hooking means disposed on said overlap segment and adjacent
25 said second clasp segment, said hooking means being formed so as to be
26 engagable with said pair of hooks; and

27 a clasp operatively associated with said first and second
28 clasp segments, said clasp securing said first and second clasp segments
29 together when said body portion is arranged to take a circular form and said
30 second clasp segment overlaps said first clasp segment, said overlap segment
31 overlapping said underlap end.

1 26. A clamping band as claimed in Claim 25, wherein said hooking
2 means comprises a pair of shoulders on opposing sides of said predetermined
3 width, said pair of shoulders being formed where said predetermined width of
4 said body member adjoins said narrower width of said second clasp segment.

1 27. A clamping band as claimed in Claim 25, wherein said clasp
2 means comprises a clasp band which is crimped to closely fit around said
3 first and second clasp segments.

1 28. A clamping band as claimed in Claim 25, further comprising a
2 breakaway leg extending from said overlap end, said breakaway leg
3 facilitating the tightening of said clamping band around said member to be
4 clamped, said breakaway leg being readily capable of breaking free of said
5 overlap end.

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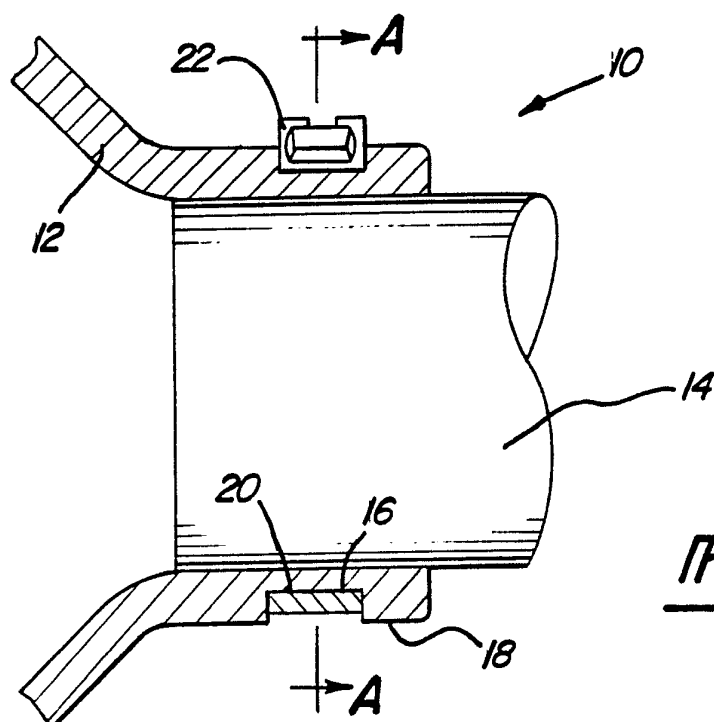


Fig-1

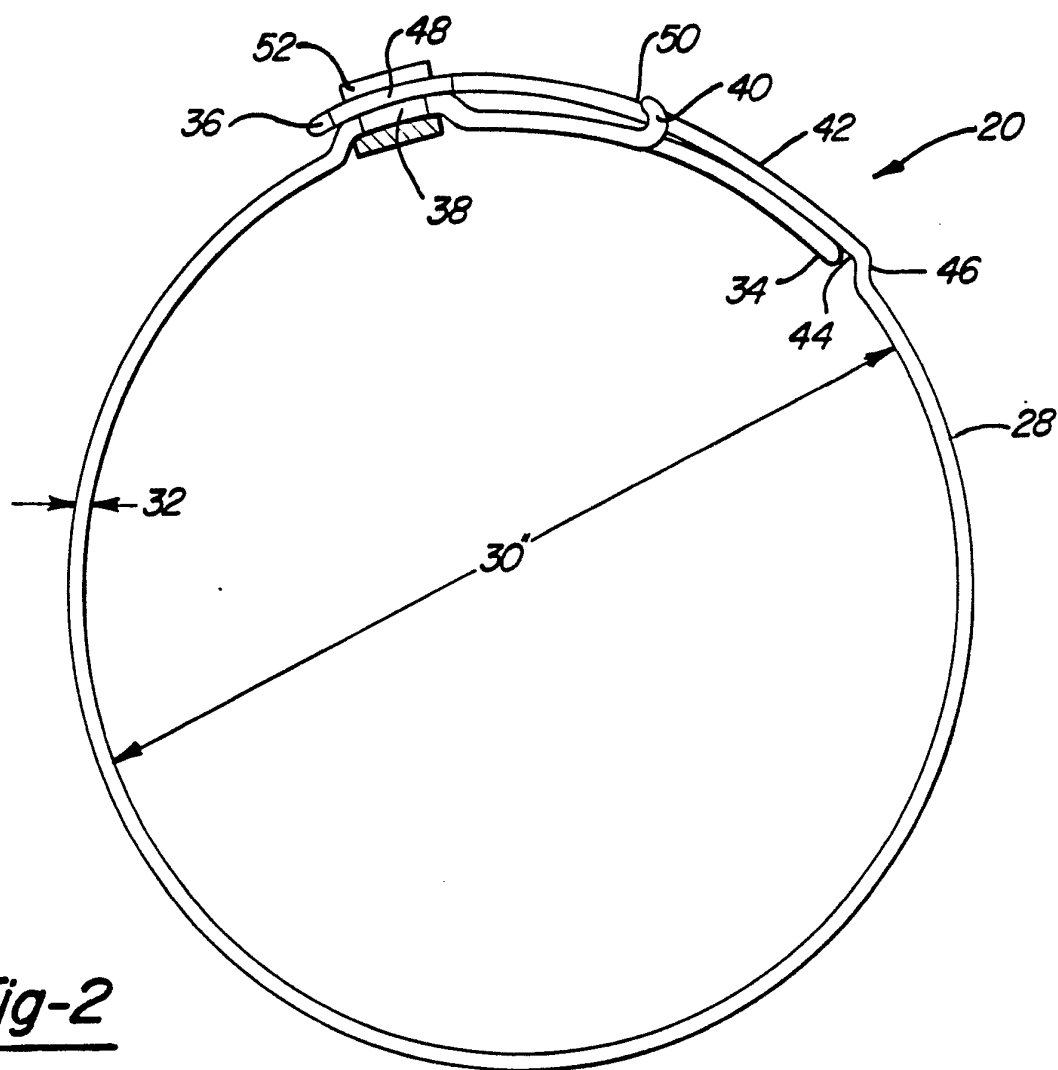


Fig-2

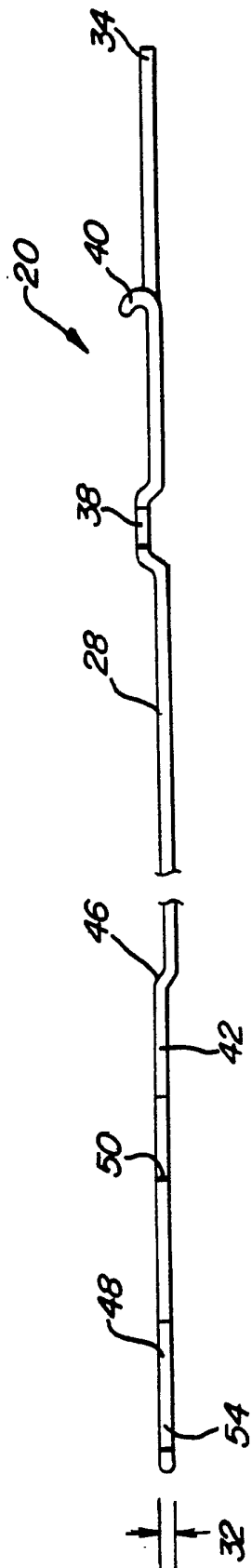


Fig-3

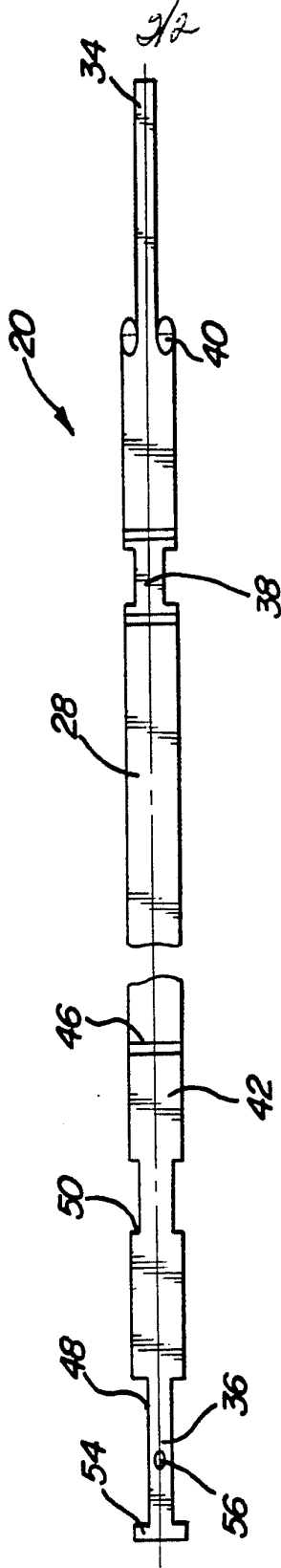


Fig-4

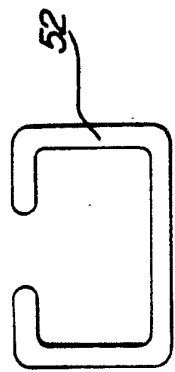
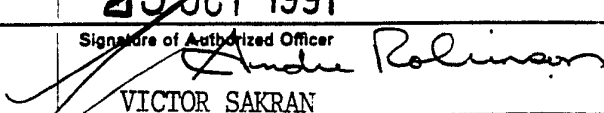


Fig-5

INTERNATIONAL SEARCH REPORT

International Application No.

PCT/US91/04669

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ⁶		
According to International Patent Classification (IPC) or to both National Classification and IPC IPC(5): B65D 63/00 US CL.: 24/20R, 20CW, 20EE, 23EE		
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁷		
Classification System	Classification Symbols	
US	24/20R, 20CW, 20EE, 20TT, 20W, 23W, 23EE	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁸		
III. DOCUMENTS CONSIDERED TO BE RELEVANT ⁹		
Category [*]	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
A	US, A, 4,237,584 (OETIKER) 09 December 1980	
A	US, A, 4,802,261 (MIZUKOSHI et al.) 07 February 1989	
A	US, A, 4,742,600 (CALMETTES et al.) 10 May 1988	
A	US, A, ,4430,775 (ARTHUR) 14 February 1984	
A	US, A, 3,295,176 (BRIGHT) 03 January 1967	
A	US, A, 1,483,714 (BROOKS) 12 February 1924	
[*] Special categories of cited documents: ¹⁰ "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. "&" document member of the same patent family		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	
23 SEPTEMBER 1991	25 OCT 1991	
International Searching Authority	Signature of Authorized Officer	
ISA/US	 VICTOR SAKRAN	