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(54)	Benevnelse	<b>HOSE CLAMP</b>
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## Description

### Prior Art

[1] An open hose clamp, in which both end portions of the clamping band have toothed sections for mutual engagement in the overlapping condition, is known from US 4,053,965. In order to hold the end portions in engagement, it is considered to provide a clip or the like, which is not explained in detail.

[2] US 3,078,532 discloses such a clip which surrounds like a ring both ends of a clamping band which in this case is toothed throughout. Such a ring-shaped clip constitutes an additional structural part, which may be lost and which renders the mounting process more difficult. Moreover, the clip projects from the internal surface of the clamp and is therefore problematic with regard to the tightness of the connection.

[3] US 1,804,725 discloses a having a clamping band the ends of which, in the mounted condition, form mutually overlapping end portions having toothed sections at mutually facing surfaces, and retaining means holding the toothed sections in mutual engagement, wherein the toothed section of a first end portion is formed at the outer side of a first tongue, which has a width smaller than the full band width, and the retaining means has a raised portion formed in the second end portion, the raised portion carrying at its inner side the other toothed section and forming an opening facing in the circumferential direction for passing the first tongue. One of the toothed sections is provided on the outer side of a tongue, the other on the inner side of a raised portion which has an opening for inserting the tongue in the circumferential direction of the clamp. The raised portion has a web which forms an inner limitation for the inserting opening and lies between the tongue and the hose to be clamped. The web constitutes an unevenness at the inner side of the hose clamp facing the hose and is, therefore, suited for relatively thick and soft hoses only. The web also creates a spacing between the tongue and the hose, which must be overcome when the clamp is tightened.

[4] In the known hose clamp, the tongue is toothed also at its underside so that considerable frictional forces occur upon tightening, which tend to entrain the hose circumferentially. Deformations caused thereby in the hose can lead to leaks between the hose and the underlying object such as a nipple.

## 35      **Summary of the Invention**

[5]            It is the object of the invention at least in part to overcome shortcomings as occur with comparable prior-art hose clamps. A more specific object of the invention may be seen to reside in a hose clamp which is easy to close and tighten and which has a smooth internal surface throughout its circumference to reduce the  
40      danger of leaks.

[6]            This objet is met by the hose clamp defined in claim 1. There, the tongue which is toothed on its outer side extends through an aperture that is formed in a step existing in the other end portion of the clamping band. This avoids the clip or web required in the prior art, thereby enabling a smooth internal surface free of  
45      projections and gaps throughout the circumference and avoiding leaks.

[7]            The embodiment of the invention in accordance with claims 2 and 3 results in that no gap can occur under the raised portion in the tightened condition of the clamp so that the hose is pressed against the underlying object also in this area, and leaks are avoided.

50      [8]            In the embodiment of the invention according to claims 4 and 5, any gap is avoided at the end of the clamping band portion provided with the raised portion thereby removing the risk of leaks also at this point.

[9]            The feature of claim 6 provides a lateral guide of the inner clamping band end in such a manner that this end is prevented from escaping laterally at the time  
55      the clamp is closed and tightened. The structure set forth in claim 7 permits the clamping band ends to hook into one another in the not yet tightened condition, thereby facilitating the engagement of a tightening tool

[10]           In the embodiment of the hose clamp according to claim 8, the tightening condition of the hose clamp may be visually detected.

60      [11]           The structures according to claims 9 to 13 are useful for engaging a tightening tool which may be shaped as a pair of pliers. The structure according to claim 11 is particularly suitable in that it reduces the risk of the hose being damaged by the tightening tool. In the embodiment of claim 12, one of the tightening means simultaneously acts as a protection against buckling, in the further embodiment of claim  
65      13 also as a stop for limiting the closing movement.

[12]           The embodiment of the hose clamp in accordance with claim 14 is particularly suited for airbags, wherein the apertures provided in the inner clamping band portion effect an anchoring in the airbag material.

[13]           The embodiment of the hose clamp in accordance with claim 15, the hose  
70      clamp is suited for tightening means using a worm gear.

## Brief Description of the Drawings

[14] Embodiments of the invention will be described in more detail below with reference to the drawings, in which:

- 75 Fig. 1 is a perspective view of a hose clamp in accordance with a first embodiment shown in its closed but not yet tightened condition;  
 Figs. 2 and 3 are a perspective view and, respectively, a side view of the hose clamp of Fig. 1 in its straight condition;  
 Fig. 4 is a side view of the hose clamp of Fig. 1 in its closed but not yet tightened condition;  
 80 Fig. 5 is an enlarged view of a portion of the hose clamp shown in Figs. 1 to 4;  
 Fig. 6 is a plan view of the tongue of the hose clamp in accordance with another variation;  
 Fig. 7 is a perspective view similar to Fig. 1 of a hose clamp in accordance with a second embodiment shown in its closed but not yet tightened condition;  
 85 Fig. 8 is a perspective view again similar to Fig. 1 of a hose clamp in accordance with a third embodiment shown in its closed but not yet tightened condition;  
 Fig. 9 is a perspective view similar to Fig. 2 of the hose clamp of Fig. 8 in its straight condition; and  
 90 Figs. 10 and 11 are side views of the hose clamp of Figs. 8 and 9, shown in its closed but not yet tightened condition.

## Embodiments

[15] The hose clamp shown in Figs. 1 to 4 consists of a clamping band **10** the first end portion **11** of which terminates in a first tongue **12** having a width smaller than the full width of the clamping band **10**. The second end portion **13** has a raised portion **15** spaced from the free end **14** which, as viewed from the end **14**, starts with an outward projecting first step **16** and terminates with an inward returning second step **17** which is symmetrical to the first step **16**. The height of the steps **16**, **17** is substantially equal to the thickness of the clamping band **10**. The first step **16** has an aperture **18** and the second step **17** has an aperture **19** for passing the tongue **12**. Fig. 1 shows the hose clamp in a pre-bent, closed but not yet tightened condition in which the tongue **12** extends through the apertures **18** and **19**.

[16] The outer side of the tongue **12** is provided with a toothed section **20** the teeth of which are shaped like saw teeth having one side substantially perpendicular to the band surface and one inclined side which faces the tip of the tongue **12**. The

surface **21** of the tongue **12**, which is the radially inner surface with respect to the curved hose clamp, is smooth.

[17] As shown in Figs. 3 and 4, the second end portion **13** has a toothed section **22** at its inner surface within the raised portion **15**. The teeth of the toothed section **22** are also saw-tooth shaped having one side substantially perpendicular to the band surface and one inclined side facing the free end **14**. The pitch of the teeth of the toothed section **22** may be twice or a multiple of that of the teeth of the toothed section **20** of the tongue **12**. It is advantageous to make the pitch of the toothed section **20** of the tongue as small as possible to enable the diameter of the hose clamp to be brought to the desired value upon tightening as closely as possible.

[18] The hose clamp shown in Figs. 1 to 4 is axially positioned or is opened and placed around the object to be tightened, such as a nipple surrounded by a hose, whereupon the tongue **12** is fed through the apertures **18** and **19** with the toothed sections **20**, **22** catching one another. During the subsequent tightening, the tongue **12** moves further through the apertures **18**, **19**. At the same time, the toothed section **22** of the second band end portion **13** between the steps **16** and **17** is pressed against the toothed section **20** of the tongue **12**. This prevents unintentional opening of the hose clamp.

[19] Tightening can be done by means of a tightening tool the tightening elements of which bear at the second step **17**, on the one hand, and pull on the tongue **12**, on the other hand. Alternatively, it is possible to provide recesses at suitable locations of both end portions **11**, **13** for engagement of pointed ends of a pair of pliers, or to provide a tightening hook on the raised portion **15** for engagement of pliers.

[20] The second end portion **13** of the clamping band **10** terminates in a second tongue **24** which is narrower than the clamping band **10**. The tongue **24** is received by a channel **25** provided in the first end portion **11** and carries at its outer end a guide hook **26** which is open in the direction of the first end portion **11**. As shown in Fig. 4, the guide hook **26**, in the closed and tightened condition of the hose clamp, extends through a guide slot **27** which is formed in an outward bent portion **28** of the first end portion **11** adjacent to the inner end of the first tongue **12** and in an adjacent cover **29** of the channel **25** which is bent outward from the clamping band **10**. The cover **29** prevents the tongue **24** from projecting outward from the hose clamp.

[21] In the closed condition, the hose clamp seeks to open due to its inherent tension. This is prevented by the fact that the guide hook **26** catches the end **30** of the guide slot **27** adjacent to the first tongue **12**. With the mounted hose clamp

being thus retained in its closed condition, the subsequent tightening process may be performed without problems.

145 [22] Fig. 5 shows an enlarged part of the clamping band **10** in the area of the end **31** of the guide slot **27** remote from the first end portion **11**. With proper clamp size and tension, the guide hook **26** should be between the marks **32** and **33** provided at in this area. This permits a visual check of the clamp tension.

[23] As shown in Fig. 6, and different from Figs 1 and 2, the toothed section **20**  
150 of the first tongue **12** can have teeth extending at an angle to the longitudinal axis of the clamping band **10**. In this embodiment, the hose clamp is suited for tightening means using a worm gear.

[24] The embodiment of Fig. 7 differs from that of Figs. 1 to 4 in that the second end portion **50** has the full width of the clamping band throughout and is provided with a number of apertures **51**. This embodiment is suited for, e.g., air bags  
155 where the apertures **51** may catch in the relatively soft fabric of the air bag. Further, the formations **27...31** in the first end portion shown in Fig. 2 are omitted so that the end **52** of the second end portion **50** forms a step inside the closed hose clamp.

[25] The further embodiment shown in Figs. 8 to 11 differs from those of Figs. 1  
160 to 6 by a shorter length of the tongues **12** and **24**. Further, the raised portion **15** has lateral webs **35** between both steps **16**, **17** which, in the closed condition and in the tightened condition of the hose clamp, are disposed on both sides of the tongue **12**. The laterally closed cage thus formed increases the surface pressure exerted by the hose clamp on the hose in the area of the tongue **12**.

165 [26] The step **17** may be closed if the first tongue **12** is short. With greater tongue lengths or to permit larger diameter reductions of the hose clamp, the step is provided with an aperture, as in the embodiments of Figs. 1 to 7, through with the tongue **12** can extend to avoid friction.

[27] To tighten this hose clamp, a slightly outward projecting tightening tunnel  
170 **36** is formed on the part of the clamping band **10** adjacent to the first tongue **12**, and an outward projecting tightening hook **37** is formed on the raised portion **15** between the first and second steps **16**, **17** of the second end portion **13**. A pliers-type tightening tool may engage this tunnel **36** and hook **37**. The tightening tunnel **36** overlaps the step between the first tongue **12** and adjacent part of the clamping  
175 band **10** to constitute a protection against buckling.

[28] As further shown in Figs. 9 to 11, a nose **38** pressed out of the camping band **10** may be provided on the second tongue **24** at a location further remote from the end **14** of the second end portion **13** than the guide hook **26**. The nose **38**, in co-operation with the internal surface of the tightening tunnel **36**, prevents an inadvertent diameter reduction of the hose clamp during transport; see Fig. 10.  
180

[29] As appears from Figs. 10 and 11, the end of the tightening tunnel **36** remote from the first tongue **12** forms a ledge **39** which co-operates with an edge **40** of a window **41** cut out of the second end portion **13** to limit the closing movement.

[30] The features explained with reference to Figs. 5 and 6 may be provided  
 185 also in the embodiment of Figs. 8 to 11. Likewise, features explained with reference to Figs. 9 and 11 for limiting the closing movement and preventing an inadvertent diameter reduction are applicable also to the embodiments of Figs. 1 to 6. Further, the feature explained with reference to Figs. 8 and 11 for increasing the surface pressure exerted on the object being clamped is also applicable to the embodiment  
 190 of Figs. 1 to 6.

### Reference numbers

#### [31]

<b>10</b>	clamping band
<b>11</b>	first end portion
<b>12</b>	first tongue
<b>13</b>	second end portion
<b>14</b>	end (of <b>13</b> )
<b>15</b>	raised portion
<b>16</b>	first step
<b>17</b>	second step
<b>18, 19</b>	apertures
<b>20</b>	toothed section
<b>21</b>	inner surface
<b>22</b>	toothed section
<b>23</b>	projection
<b>24</b>	second tongue
<b>25</b>	channel
<b>26</b>	guide hook
<b>27</b>	guide slot
<b>28</b>	bent portion
<b>29</b>	cover
<b>30, 31</b>	ends of the guide slot
<b>32, 33</b>	marking lines

<b>35</b>	webs
<b>36</b>	tightening tunnel
<b>37</b>	tightening hook
<b>38</b>	nose
<b>39</b>	Ledge
<b>40</b>	edge
<b>41</b>	window
<b>50</b>	second end portion
<b>51</b>	apertures
<b>52</b>	end (of <b>50</b> )



**Patentkrav**

- 5       **1.** Slangeklemme med et klemmebånd (10) hvis ender i montert tilstand danner overlappende endepartier (11, 13) som har tannede områder (20, 22) på flater som vender mot hverandre, og med en holdeinnretning som holder de tannede områdene (20, 22) i gjensidig inngrep, der det tannede området (20) til et første endeparti (11) er utformet på utsiden av en første tunge (12) hvis bredde er mindre enn den fulle båndbredden, og holdeinnretningen har et opphøyd område (15) som er utformet i det andre endepartiet (13), bærer på sin innside det andre tannede område (22) og danner et hull (18) som er vendt i omfangsretning, for å stikke den første tungen (12) derigjennom,
- 10       **karakterisert ved at** det opphøyde området (15) begynner i en avstand fra det andre endepartiets (13) frie ende med et første trinn (16) som springer utover og har en høyde som tilsvarer tykkelsen til klemmebåndet (10), og åpningen for å stikke den første tungen (12) derigjennom er en åpning (18) i det første trinnet (16).
- 15       **2.** Slangeklemme ifølge krav 1, der holdeinnretningen har, på den siden av det første trinnet (16) som vender bort fra den andre båndenden (14), et andre trinn (17) som springer innover, med en åpning for å stikke den første tungen (12) derigjennom.
- 20       **3.** Slangeklemme ifølge krav 1, der holdeinnretningen har, på den siden av det første trinnet (16) som vender bort fra den andre båndenden (14), et andre trinn (17) som springer innover, og området mellom de to trinnene (16, 17) danner sidestykker (35) som i slangeklemmens lukkede tilstand ligger på begge sider av den første tungen (12).
- 25       **4.** Slangeklemme ifølge ett av de foregående kravene, der det andre endepartiet (13) har en andre tunge (24) hvis bredde er mindre enn den fulle båndbredden, og det første endepartiet (11) har en kanal (25) for mottak av den andre tungen (24).
- 30       **5.** Slangeklemme ifølge krav 4, der kanalen (25) på utsiden er tilveiebrakt med en tildekning (29).
- 35

**6.** Slangeklemme ifølge krav 5, der tildekningen (29) har en føringsslis (27) for et fremspring (26) som er tilveiebrakt på den andre tungen (24) og stikker frem utover.

5        **7.** Slangeklemme ifølge krav 6, der fremspringet danner en krok (26) som vender bort fra den andre båndenden, for inngrep i føringslissens (27) ende (30) som vender mot den første båndenden.

10       **8.** Slangeklemme ifølge krav 6 eller 7, der det er anordnet merker (32, 33) på føringslissen (27) for visuell konstatering av slangeklemmens spenningstilstand.

15       **9.** Slangeklemmen ifølge et av de foregående kravene, der de to endepartiene (11, 13) hvert har et middel (17, 23; 36, 37) for å få kontakt med et spennverktøy.

**10.** Slangeklemmen ifølge krav 9, der midlene for å få kontakt med et spennverktøy er fremspring (17, 23; 36, 37) som stikker frem utover.

20       **11.** Slangeklemme ifølge krav 10, der fremspringene (36, 37) er utformet i deler (10) av klemmebåndet som i klemmens spente tilstand ligger over den respektive tungen (12, 24).

25       **12.** Slangeklemme ifølge krav 10, der et av fremspringene (36) griper over et trinn som finnes mellom den første tungen (12) og den påfølgende delen av klemmebåndet (10).

30       **13.** Slangeklemme ifølge krav 10, der et av fremspringene (36) har en avsats (39) som samvirker med en kant i det andre klemmebåndpartiet for å begrense klemmens lukkebevegelse.

**14.** Slangeklemme ifølge et av kravene 1 til 3, der det indre klemmebåndendepartiet (50) er tilveiebrakt med åpninger (51).

35       **15.** Slangeklemme ifølge et av de foregående kravene, der tennene i de tannede områdene (20, 22) strekker seg på skrått av klemmebåndets (10) lengdeakse.

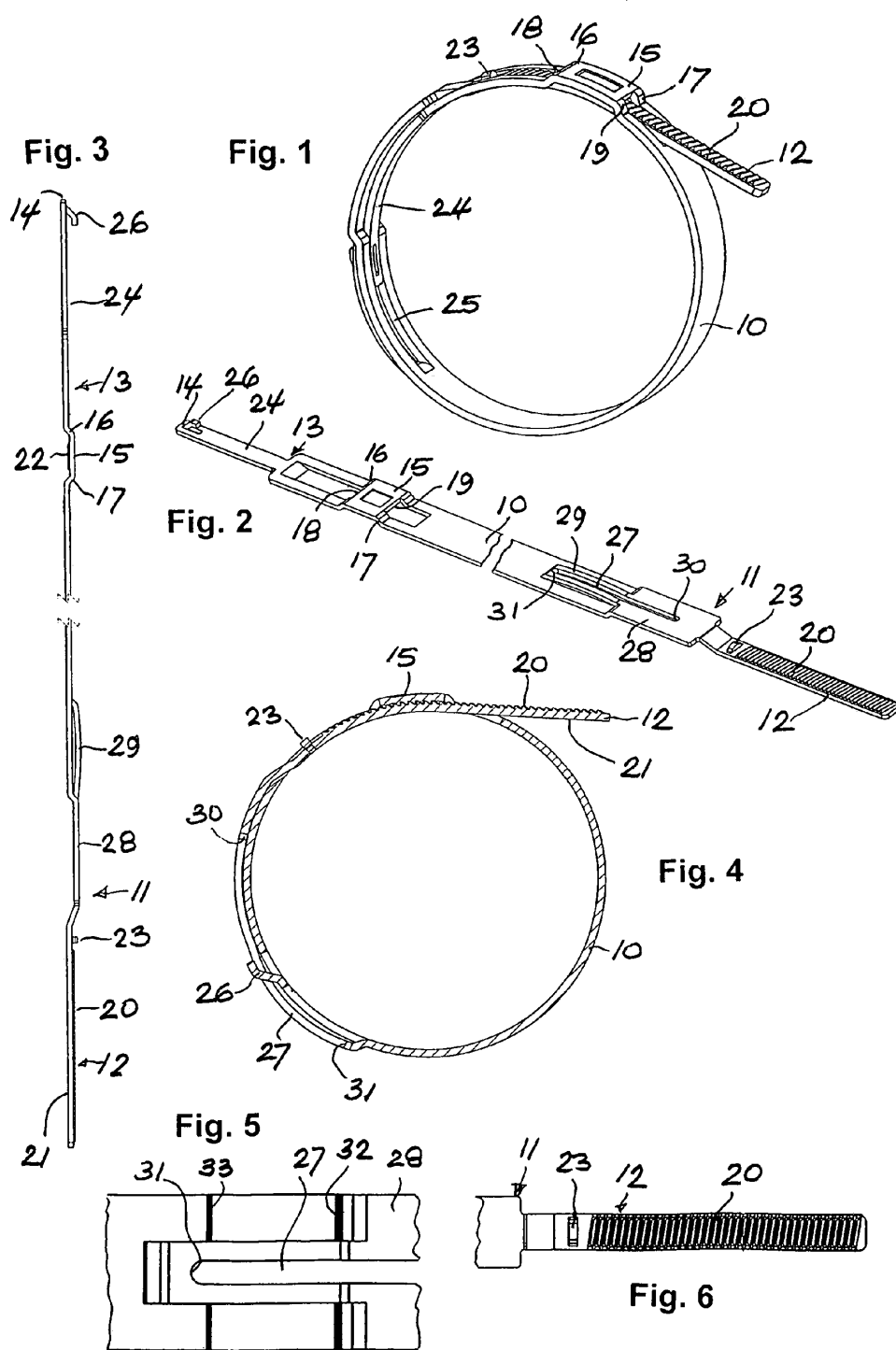


Fig. 7

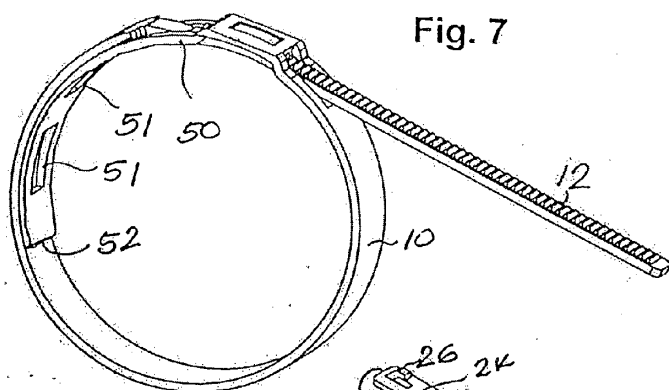


Fig. 9

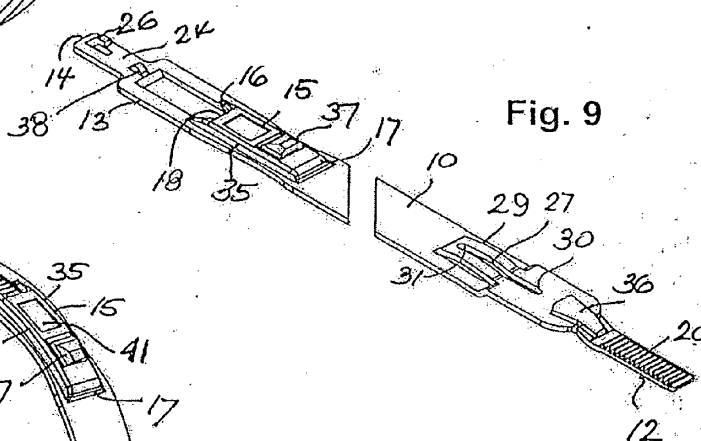


Fig. 8

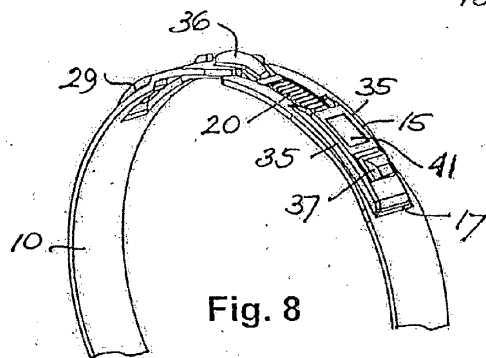


Fig. 10

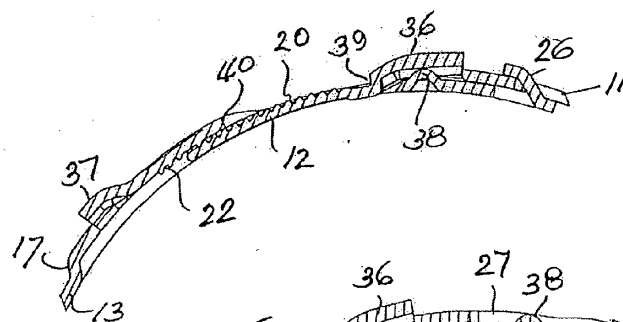


Fig. 11

