PATENT AGENT TRAINING COURSE

DRAFTING & PROSECUTION

EXERCISE 15 - DRAFTING

Your client is a parts supplier to the automotive industry. He has written to you about a new design for a clamp that he has developed for connecting hoses to metal tubes in automobile cooling systems.

He explains that there is a need for an arrangement which will hold the clamp in place on a hose before the clamp secures the hose to the metal tube. Self-tightening clamps are particularly useful on assembly lines where the clamp can be positioned and aligned on the hose beforehand. Then on the assembly line, the hose with the clamp in place is slid over the end of the metal tube and the clamp self-tightening mechanism is released to allow the clamp to tighten about the hose, after which the holder may be removed.

Your client says that he has conducted a quite thorough search and is satisfied that he has something new. He has included from his search the following patents:

Patent	Inventor
X,XXX,129	Bender
X,XXX,093	Dennis
X,XXX,X14	Yasuo
X,XXX,X33	Sidney

To illustrate his invention your client has included Figs 1 - 4, in which Fig. 1 is an exploded view showing the end of a hose, a hose clamp and a clamp holder. Broken lines on the hose show the desired location for a clamp. This clamp, commonly known as a self-tightening or constant tension clamp, is shown in its open or untightened condition and is held in this condition by a removable pin holding a tongue portion of the clamp. The clamp holder is a generally C-shaped resilient band having a width in the axial direction greater than that of the clamp. Pegs with sharp points extend inwardly along the edges of the holder and are designed to dig into the hose on each side of the clamp (Fig. 4). In this way the clamp is firmly held on the hose in the desired location while the hose is positioned and slid over the end of the metal tube. The pin is then pulled releasing the tongue portion of the clamp.

At this point, the holder has served its purpose and, because of its C-shape, can be pulled away from the assembled hose, metal tube and clamp and discarded.

The holder can be inexpensively made by injection moulding a plastic material and the inwardly projecting pegs can be staggered circumferentially (Fig. 1) to make it easier to remove the formed holder from the mould. The holder is designed to provide some inward pressure against the hose so that the points of the pegs firmly grip the hose. At the

same time, the holder must have sufficient resilience to be easily removed after the clamp is in place. This design of holder can be used with most designs of hose clamps.

Your client also points out that the design of clamp and holder shown in Fig. 1 has an additional feature in that the clamp and holder can be pre-assembled, e.g. in a factory. The clamp has some central holes that mate with some inwardly central projections on the holder when the holder is snapped over the clamp. This pre-assembled pair with the central projections of the holder being held within the central holes of the clamp can be stored, shipped and used in this form.

EXERCISE

Draft a complete patent application for filing in the Canadian Patent Office. It should include a discussion of the background of the invention and the prior art, a description of the invention, a detailed description of the drawings with reference numerals and a set of claims, including at least two independent claims.

CLIENT DRAWINGS

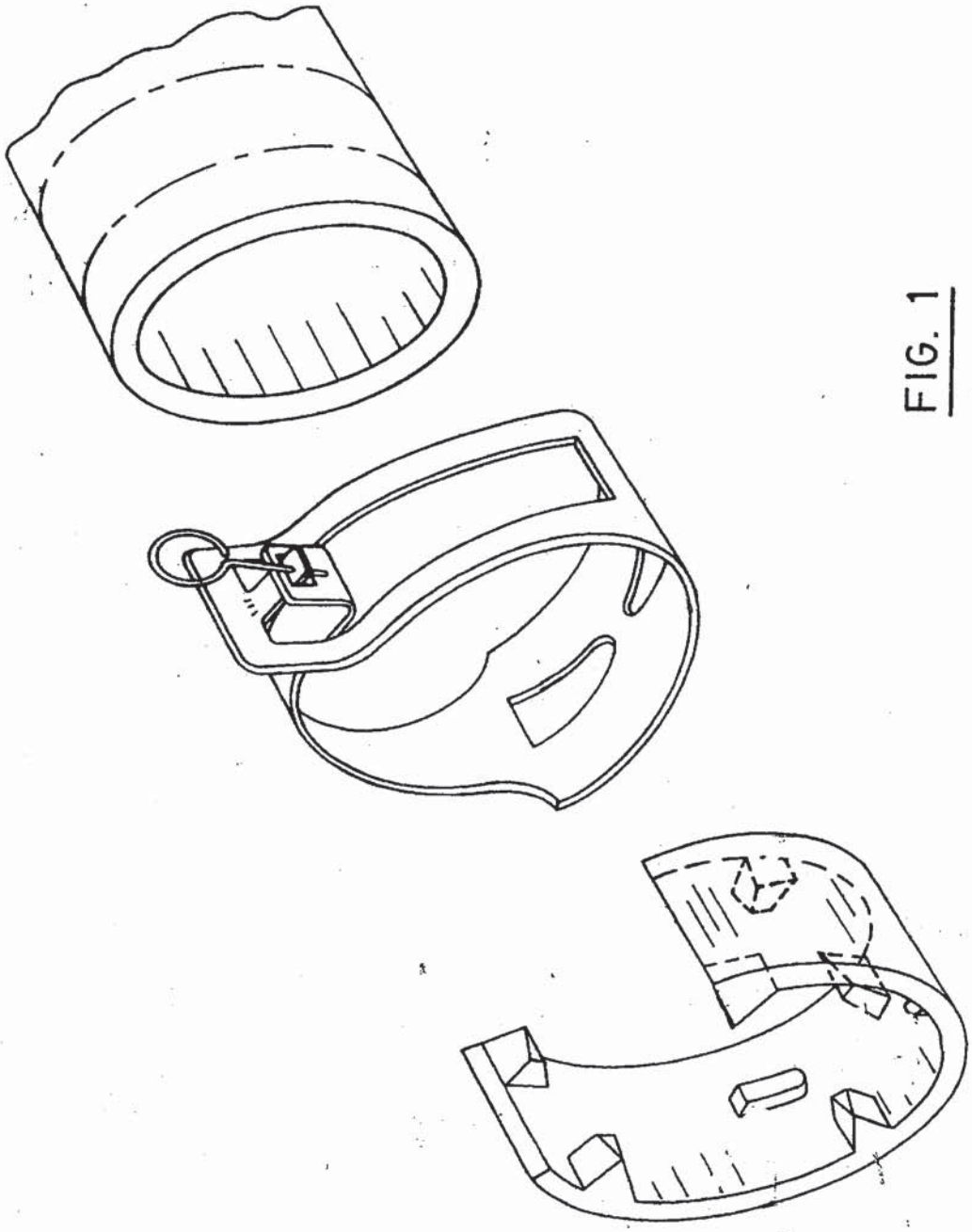

FIG. 1

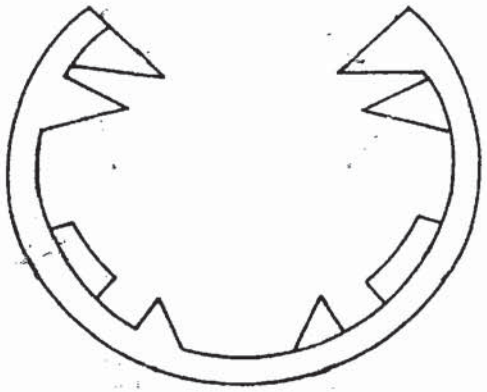

FIG. 2

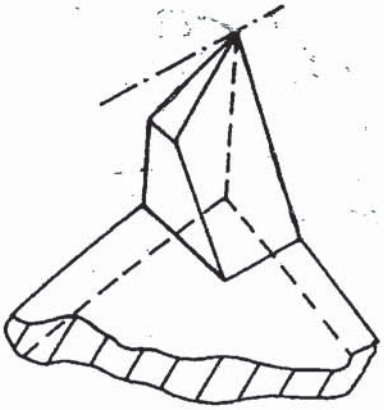

FIG. 3

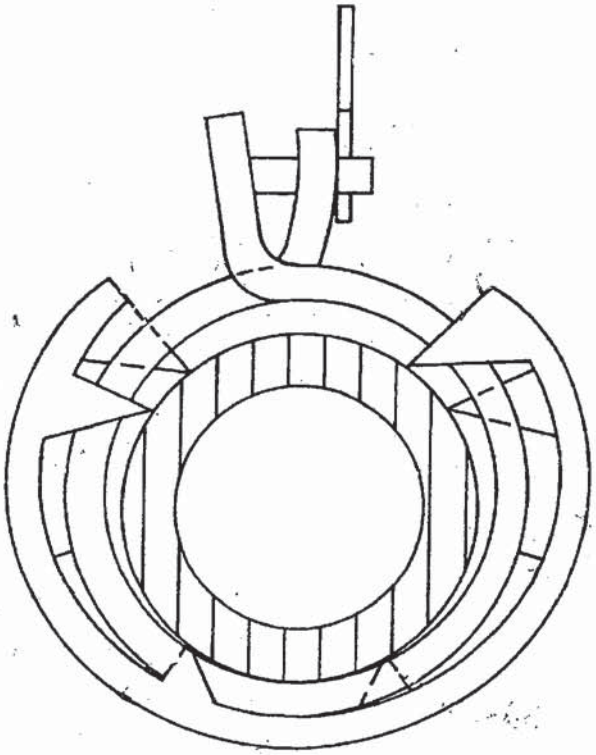

FIG. 4

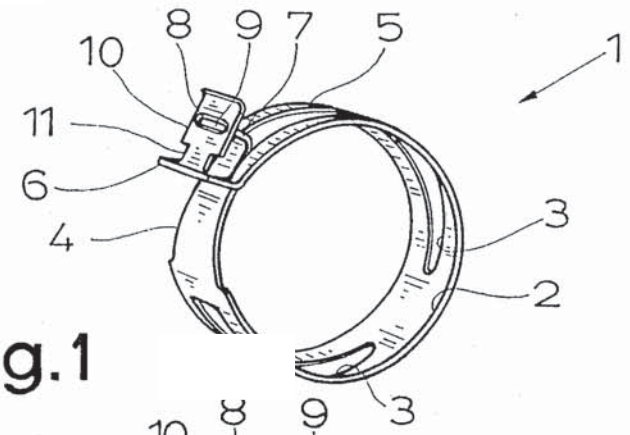

Fig.1

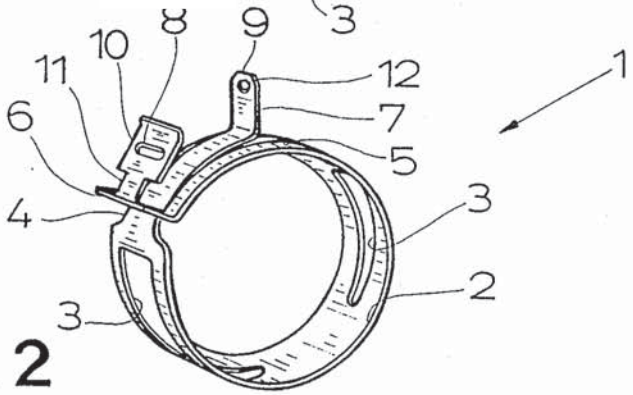

Fig. 2

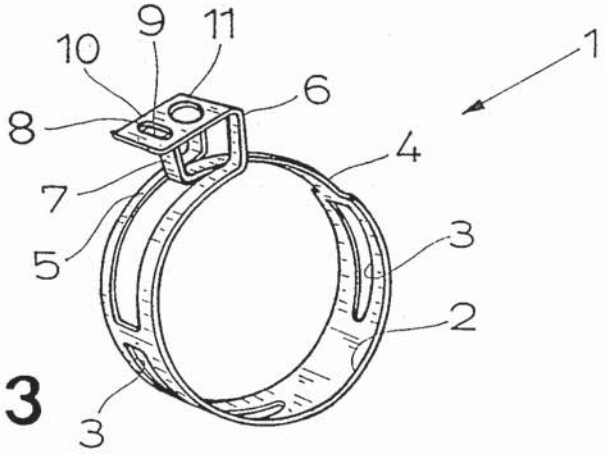

Fig.3

HOSE CLAMP

The invention relates to a hose clamp having a spring-loaded clamping body encircling the end of the hose in a generally circular manner, and overlapping clamping ends, where in the released state there exists a defined inner diameter -clamping state, and the clamping body can be spread to a considerably larger diameter against its inherent spring force by means of a spreading tool acting on the clamping ends.

BACKGROUND OF THE INVENTION

Hose clamps of the type under discussion (see for example U.S. Pat. No. 4,583,268) are particularly intended and suitable for use in hose systems with medium internal pressures, for example for cooling systems of automotive vehicles where internal pressures of no more than 2 bar are expected under operating conditions. Customarily such hose systems are tested for up to 3 bar. The pressure-proof seating of a hose end on a connecting piece of such a hose system is assured by the elasticity of the hose end itself, which mostly is a rubber hose, a rubber/plastic hose with a fabric cover, etc., and also by the spring force of the hose clamp discussed above.

Thus the known hose clamp is not clamped by means of a separate clamping element, for example a clamping screw, in order to obtain the pressure-proof seating of a hose end on a connecting piece; instead the spring force of the correspondingly highly prestressed hose clamp assures pressure-proof seating. The force which needs to be exerted on the clamping ends of the hose clamp by a tool must be correspondingly great in order to spread the hose clamp against its inherent spring force to a considerably larger and mostly maximally limited diameter. This diameter must be sufficient to move the hose clamp easily across the hose end seated on the connection piece all the way to its intended position.

When installing a hose with the known and previously described hose clamp, the hose clamp is first gripped and spread with a spreading tool and is then pushed in its spread state onto the connection piece or on the hose end. During the entire installation which then follows the hose clamp must be kept spread open by means of the spreading tool. When the hose end has been pushed onto the connection piece and has been further pushed over a form-fitting circular bead possibly provided there, the spread-open hose clamp is moved to the intended position by means of the spreading tool, the spreading tool is detached and the hose clamp released. The hose clamp springs back in the direction of its released and clamping state, becomes attached to the hose end and clamps the latter onto the connection piece.

The above description of the installation with a known hose clamp makes it clear that one hand is required for manipulating the hose clamp with the spreading tool and another hand for the manipulation of the hose end itself. This plus the fact that the hose clamp can only be manipulated with a spreading tool and by bringing considerable spreading force to bear, causes problems in installation and other operational use.

SUMMARY OF THE INVENTION

Objects of the invention are to improve hose clamping and to improve the known hose clamp described above in such a way that it can be manipulated without a special tool and particularly can be manipulated by hand for clamping a hose end to a connection piece.

The hose clamp according to the invention by means of which the above identified objects are attained is characterized in that the clamping ends can be locked in respect to each other in the spread-open state of the clamping body and can then easily be unlocked from each other for clamping a hose end.

Thus the hose clamp is designed in accordance with the invention such that it can be brought into the spread-open state before application and remains in this state until it is used at the work place. This is made possible by the locking of the two clamping ends. When installing the hose clamp in a hose system of the type described above, the clamping ends of the hose clamp need to be unlocked only at the work place as soon as the hose clamp has been seated on the intended location on the connection piece. The hose clamp then springs back by itself into the clamping state as described above. It is important that a special spreading tool no longer is required for the use at the work place. At most it might be required to use a common tool, such as a screw driver or the like, to unlock the clamping ends.

The hose clamp according to the invention can also be manipulated particularly advantageously by hand. Furthermore, the hose clamp according to the invention can be used particularly advantageously in the course of the automated installation of hoses by means of industrial robots.

Other objects and the nature and advantages of the present invention will be more apparent from the detailed description of various preferred embodiments described below. They will be further explained below in connection with the invention by means of the drawings, wherein:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows in a schematic and perspective view a first exemplary embodiment of a hose clamp according to the invention in the spread-open state,

FIG. 2 shows the hose clamp of FIG. 1 in the clamping state in a view to FIG. 1, and

FIG. 3 shows a second exemplary embodiment of a hose clamp according to the invention in the spread-open state in a view similar to FIG. 1.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The hose clamp 1 shown in the drawings has a spring-loaded clamping body 2 for surrounding a hose end, not shown, in a generally circular manner. The clamping body 2 has a plurality of punched out holes 3, 4, 5 or, respectively, recesses to attain a defined spring characteristic or, respectively, to attain defined geometric conditions. Furthermore, clamping ends 6, 7 overlapping each other are formed on the clamping body 2. In the unlocked state the hose clamp 1 has an inner diameter smaller than the corresponding outer diameter of the hose end with which it is intended to be used, and can be spread open against its inherent spring force to a considerably larger diameter, i.e. a spread-open state, by a spreading tool, not shown, acting on the clamping ends 6, 7. The clamping ends 6, 7 can be disposed and/or formed in such a way that they blockingly rest against each other when reaching a defined, maximally spread-open position. In any event, the hose clamp 1 snaps back into the direction of its clamping state under

the influence of its inherent spring force as soon as it has been released from the spreading tool.

It is an important feature of the hose clamp **1** according to the invention that the clamping ends **6, 7** can be locked with each other in the spread-open state of the clamping body **2** and can be unlocked again for clamping a hose end. Thus it is important that initially the hose clamp **1** can be brought into the spread-open state such that the hose clamp **1** then retains this spread-open state on its own so that afterwards the spreading tool is no longer needed for the manipulation of the hose clamp **1**. This means in particular that the hose clamp **1** according to the invention can be pushed onto a hose end, which is to be secured, without the use of a spreading tool at the work place and that then the clamping ends **6, 7** only need to be unlocked from each other when the desired position of the hose clamp **1** has been reached in order to return the hose clamp **1** into its clamping state again.

FIG. **1** shows an actual structure of the hose clamp **1** in which one clamping end **6** has a locking recess **8** and the other clamping end **7** has a locking projection **9** which can be lockingly inserted into the locking recess **8**, by means of which the locking of the two clamping ends **6, 7** is realized. Other designs of locking recesses are conceivable for the same purpose, for example two locking hooks provided on one clamping end and laterally embracing the other clamping end. Also conceivable are, for example, surfaces of the overlapping clamping ends in the form of sawteeth. It is obvious that a number of designs can be found for locking together the clamping ends to force the clamp open against its natural spring biased released-clamped state.

When designing the locking together of the clamping ends **6, 7** by means of the locking recess **8** and the locking projection **9** it is suggested that the locking projection **9** in general extend radially away from the clamping body **2** and that it form the locking connection with an in general radially extending edge of the locking recess **8**. A comparison of FIGS. **1** and **2** shows this very clearly. In this case it is practical that for locking, the locking projection **9** enter the locking recess **8** radially from the inside and particularly that the locking recess **8** be radially open to the outside; and that for the purpose of unlocking the locking projection **9** can be pushed from the outside generally in a radial direction inwardly through the locking recess **8**. This feature proceeds from the realization that the spring force acting in the spread-open state of the hose clamp **1** is generally directed tangentially, so that a radial displacement of the locking projection **9** in respect to the locking recess **8** requires relatively little force. Thus the hose clamp **1** is especially easy to manipulate.

The drawings show an especially preferred embodiment of the invention in that the clamping ends **6, 7** are generally bent away radially from the clamping body **2** and preferably the locking projection **9** constitutes the end of a clamping end **7**. In particular it is true for both cases, i.e. the exemplary embodiment in accordance with FIG. **1** and the exemplary embodiment in accordance with FIG. **3**, that one clamping end **6** is formed in the shape of an inverted letter U and that the other clamping end **7** is formed in the shape of a projection and is disposed with its free end **9** approximately at the radial height of the bottom of the U the one clamping end **6** between the legs of the U.

It is shown in the drawings that in accordance with a further preferred feature of the invention one clamping

end, in particular the clamping end **6** here in the form of an inverted letter U, may have a stop bar **10** generally extending towards the other clamping end **7** tangentially or in the form of a peripheral arc. In the exemplary embodiment of FIGS. **1** and **2** the stop bar **10** has been bent out of the material of the clamping end **6**.

The constructions described above are very practical in a manufacturing sense and permit a cost-efficient production of the hose clamp **1** of the invention. In connection with these constructions it is advantageous to dispose the locking recess **8**, if such should be present, in the stop bar **10**.

In connection with the above description, FIG. **3** shows a particular embodiment which is characterized in that the clamping end **6** in the form of an inverted letter U is in general radially bent away at a first bending location from the clamping body **2** and, particularly for the purpose of forming the stop bar **10**, is bent back at a second bending location, which is at a distance from the first bending location, in the direction towards the other clamping end **7** generally tangentially or in the form of a peripheral arc in respect to the clamping body **2**. In a practical manner the recess **5** in the clamping end **6** is drawn radially outwardly so that the clamping end **7**, also extending radially outwardly, can enter through the recess **5** between the legs of the clamping end **6**.

As shown in the drawings it is preferred that the two clamping ends **6, 7** be provided with manipulation projections and/or manipulation recesses **11, 12** for use with a tool not further shown. These manipulation projections and/or manipulation recesses **11, 12** can be used either for applying a spreading tool or an unlocking tool, for example when using the hose clamp **1** of the invention for the automated installation of hoses by means of industrial robots.

As the drawings show in detail, it is practical to provide the manipulation recesses **11** in the stop bar **10** in the one clamping end **6**. This applies to the exemplary embodiment of FIG. **1**. In the exemplary embodiment of FIG. **1** the manipulation recesses **11** may be disposed on the edge of the stop bar **10** in the one clamping end **6**. In the exemplary embodiment in FIG. **3** the manipulation recess **11** is desirably in the form of a circular opening, particularly a bore, in the stop bar **10** in the one clamping end **6**. Finally, in both exemplary embodiments the manipulation recess **12** at the other clamping end **7** is suitably disposed in the form of a circular opening, in particular a bore. It is obvious that although these forms of the manipulation recess **11, 12** are advantageous, they do not exclude other embodiments. For example, instead of the manipulation openings **11, 12**, manipulation projections can be provided at the clamping ends **6, 7**.

It will be obvious to those skilled in the art that various other changes and modifications may be made without departing from the scope of the invention and the invention is not to be considered limited to what is shown in the drawings and described in the specification.

What is claimed is:

United States Patent [19]
Dennis

[11] **Patent Number:** XXX'093
[45] **Date of Patent:** April 20, 1990

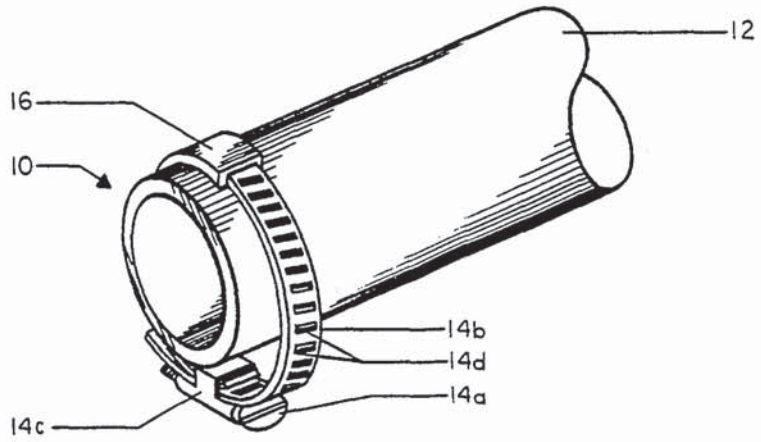

FIG. 1

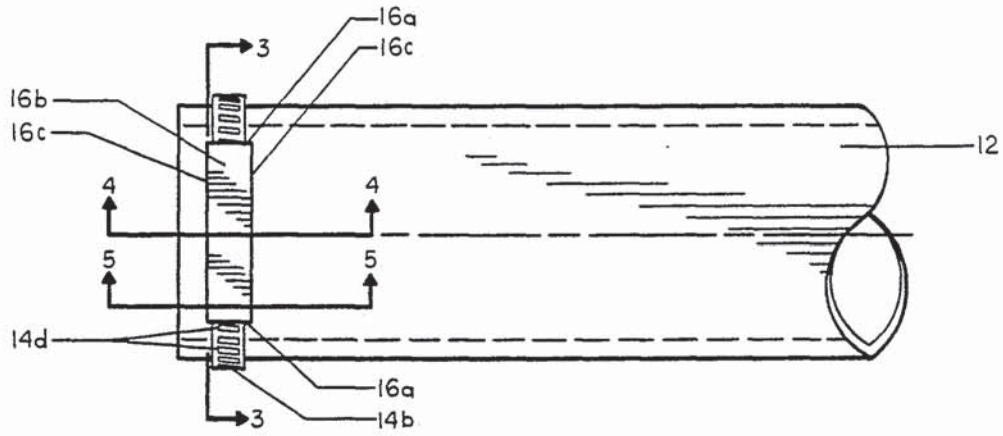

FIG. 2

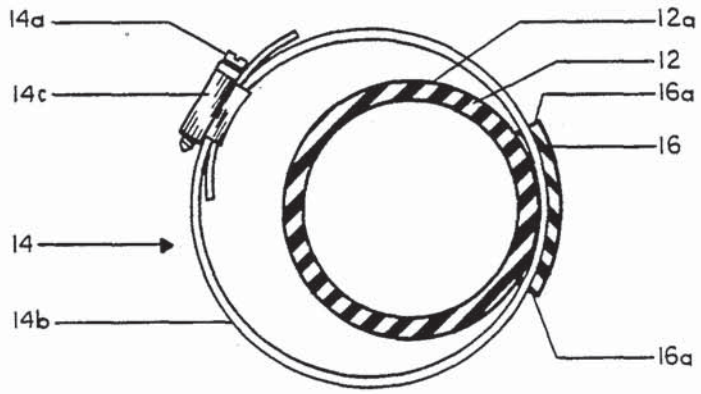

FIG. 3

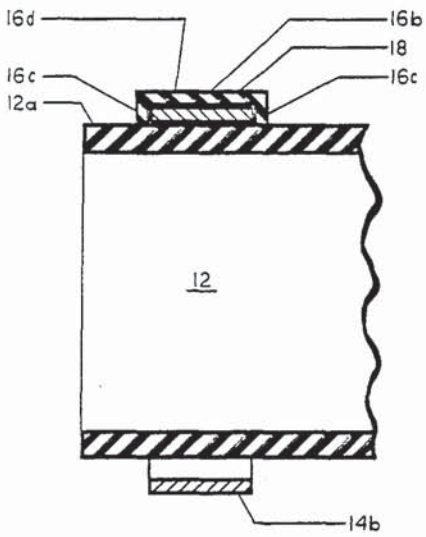

FIG. 4

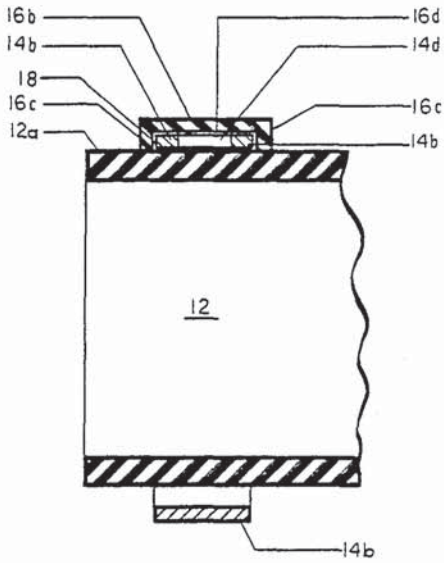

FIG. 5

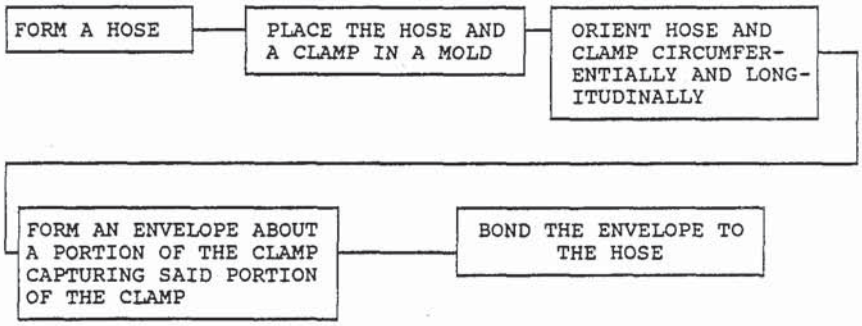

FIG. 6

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HOSE AND CLAMP ASSEMBLY AND METHOD FOR MAKING THE SAME

BACKGROUND

1. Field of the Invention.

The invention relates generally to hose and clamp assemblies and, more particularly, to a hose and clamp assembly wherein a clamp is assembled onto a hose with an elastomeric envelope that is bonded to the hose.

2. Description of the Related Art.

Reference will be made in the following description to the radiator hose art in order to facilitate an understanding of the structure, function and significance of the invention. However, and as will become quite apparent hereinafter, the invention may be utilized to advantage in quite different environments.

In the assembly of automotive radiator hoses, it is the typical practice for a hose manufacturer to mold or otherwise suitably form a predetermined length of flexible hose for installation on a particular vehicle in accordance with the distance between the engine block and the radiator fittings to be placed in fluid communication by the use of such hose. The length of the hose is preferably held to a minimum to save material and cost while being just long enough so that the opposite ends of the hose will project over the respective fittings to a sufficient extent to enable a subsequently installed hose clamp to tightly engage the hose ends about the fittings for a fluid-tight connection.

Thus, the respective hose and clamp manufacturers deliver their products to automotive plants where numerous separate storage facilities are required in accordance with the number of different types and sizes of hoses and clamps required to be maintained on hand until a need for them may arise. Similar storage facilities are required on the assembly line. A worker on the assembly line will select different hoses and clamps depending upon the particular vehicle on the assembly line; different kinds and models of vehicles are often assembled on the same assembly line. The worker then assembles the selected hose with the appropriate hose clamps on a given vehicle.

As a typical example of such an assembly operation, in assembling a single radiator hose on a vehicle assembly line, the assembler will first grasp a hose of proper size from one storage area and a pair of clamps from another storage area, assuming that the same size and type of clamp is to be used on opposite ends of the hose as is the usual case. The assembler then slides both clamps onto the hose, manipulates one of the clamps toward one end of the hose, slips that end of the hose over its associated fitting, and tightens the clamp onto the hose and the fitting by using a power-driven screw driver or the like. Thereafter, the worker will shift the other clamp to the other end of the hose to make the other connection in a similar manner. In many instances, one of the clamps is not tightened down at the initial assembly station in which the first clamp is tightened. The free clamp may slide off the hose while the vehicle is in transit to a subsequent assembly station where it is to be tightened.

In the final analysis it is necessary to handle three separate parts as the vehicle moves down the assembly line in assembling each radiator hose, there of course being two such radiator hose and clamp assemblies for each vehicle. During manipulation of the clamps onto the hose during the assembling operation, it is extremely important for the assembly line operator to properly position the clamps at the respective end portions of the hose to insure that, once they are tightened, a proper fluid tight connection results. Notwithstanding the importance of making this fluid tight connection, due to the press of time available on the assembly line while the various parts are being manipulated, it often happens that one or more of the clamps are canted off the end of the hose or otherwise disposed thereon in such a manner as to result in leakage with obvious deleterious consequences.

Contributing to this aspect of the problem with known hose assemblies is the fact that such clamps are very difficult to handle while using the power-driven screw driver to tighten the clamps. That is, the clamp has a tendency to rotate about the axis or body of the hose when engaged with the power-driven screw driver, requiring that the assembly line operator actually grasp the clamp to hold it in position during this operation. Furthermore, and as alluded to above, it often happens that both clamps are not tightened down at the same station at which they are placed on the hose, resulting in the free clamp dropping from the hose while it is in transit to a subsequent station.

Accordingly, three basic methods for assembling a clamp onto the end of a hose have been developed. In one method, the clamp is stapled to the hose. However, this method pierces the hose which can result in the hose tearing when under stress with a subsequent loss of the fluid tight connection. Also, the stapling operation must be carefully controlled in order to assure that the staple does not pierce the interior wall of the hose which could disrupt the fluid tight connection. Further, the damaged materials would have to be replaced, causing great waste.

The second method for assembling clamps onto the end of a hose involves gluing or otherwise adhesively bonding the clamps to the hose surface. However, this method is not durable as the adhesive bond may fracture when the hose and clamp are subjected to flexing such as occurs during installation of the hose into a vehicle.

The third method, which is described in U.S. Pat. No. 3,365,218 entitled Hose and Clamp Pre-assembly, and which was issued on Jan. 23, 1968 to R. T. Dynes, involves a pair of opposed tabs which are molded to the surface of the hose. The hose clamp is received between the molded tabs and held in place until the hose is installed in a vehicle. However, this system requires loosening each clamp prior to the final assembly or holding the clamp diameter to tight tolerances. Finally, this method is inconvenient when working with small clamps.

Therefore, it would be useful to provide a device for assembling a clamp onto a hose that was secure, integral with the hose, and which did not require that the clamp be loosened prior to final assembly. Similarly, it would be useful to provide a means for retaining a clamp on a hose thereby circumferentially and longitudinally orienting the clamp relative to the hose such that neither circumferential rotation nor axial movement of the clamp with respect to the hose is possible.

SUMMARY OF THE INVENTION

The invention relates to a method for making a hose and clamp assembly comprising the steps of forming a hose, placing a clamp on the hose, forming an envelope

XXX'093

on the hose and about a portion of the clamp, thereby capturing the clamp, and bonding the envelope to the hose. The envelope is formed from an elastomer which may be adhesively bonded to or integrally vulcanized on the hose. The envelope retains the clamp, thereby circumferentially and longitudinally orienting the clamp on the hose. The clamp can neither rotate circumferentially nor move axially with respect to the hose. The clamp can include a band which encircles the hose and means for facilitating capture by the envelope.

Further, the invention relates to a hose and clamp assembly comprising a hose, a clamp positioned on the hose, and a means for retaining the clamp on the hose wherein the means for retaining the clamp comprises an elastomeric envelope bonded to the hose and capturing a portion of the clamp. The envelope circumferentially and longitudinally retains the clamp, thereby orienting the clamp relative to the hose such that the clamp neither rotates circumferentially nor moves axially with respect to the hose. The envelope can be adhesively bonded to or integrally vulcanized on the hose. The clamp can include a band encircling the hose and means for facilitating capture by the envelope.

BRIEF DESCRIPTION OF THE DRAWINGS

Reference should now be had to the embodiment illustrated in the drawings and described below. In the drawings:

FIG. **1** is a fragmentary perspective view of an automotive radiator hose showing a clamp assembled thereon by way of the invention in the form of an elastomeric envelope;

FIG. **2** is a plan view of the invention of FIG. **1**;

FIG. **3** is a cross-sectional view taken along lines **3—3** of FIG. **2**;

FIG. **4** is a longitudinal sectional view taken along lines **4—4** of FIG. **2**;

FIG. **5** is a longitudinal sectional view taken along lines **5—5** of FIG. **2** and taken through a slot in a band of the clamp; and

FIG. **6** is a block diagram showing schematically the steps comprising the method according to the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The invention relates to a solution of various storage and assembly problems encountered in ultimately providing a fluid tight hose connection between a pair of spaced, fixed fittings of the type employed on automotive vehicles, such as radiator hose connections, fuel filler lines, hose connections for air-conditioning systems, and the like. Consequently, specific reference will be made in the following description to the radiator hose art in order to facilitate an understanding of the structure, function and significance of the invention. However, and as will become quite apparent hereinafter, the invention may be utilized to advantage in quite different environments.

Turning now to the drawings, and in particular FIG. **1**, the invention, in the form of a hose and clamp assembly and designated generally by the reference numeral **10**, is shown in conjunction with a hose **12** and a clamp **14**. The hose **12** is shown in the form of a radiator hose, it being understood that fuel filler hoses, fuel line hoses, air induction hoses, transmission lines, air injection tubes, drain hoses, washing machine hoses, and fluid or

air conveyance tubes or hoses generally may also be assembled according to the invention.

Similarly, the clamp **14** is shown in the form of a conventional radiator hose clamp **14** having a worm screw **14*a***, a band **14*b***, a clamp screw housing **14*c***, and a plurality of slots **14*d*** formed in the band. Again, it should be understood that the hose and clamp assembly **10** is not limited to uses in conjunction with radiator hose clamps. Any clamp, preferably having at least one hole, notch, slot or perforation in the band or having a lug, clamp screw housing, socket, or similar means for enabling or facilitating an elastomeric envelope to adhere to and around or encapsulate or capture a portion of the clamp **14**, may be suitably employed.

The clamp **14** is longitudinally and circumferentially retained on the hose **12** by way of a retaining means, which is shown in the drawings in the form of an elastomeric envelope **16**. The envelope **16** has opposite ends **16*a***, a top side **16*b***, lateral edges **16*c***, and an underside **16*d***.

As best shown in FIGS. **2** through **5**, the lateral edges **16*c*** of the elastomeric envelope **16** are bonded to an outer surface **12*a*** of the hose **12**, thereby creating a channel **18** between opposite ends **16*a*** of the envelope **16**. The channel **18** forms an elongated passage way between the underside **16*d*** of the envelope **16** and the outer surface **12*a*** of the hose **12**. Received in the channel **18** and extending about the circumference of the hose **12** is the clamp **14**, which is in a close engaging or adhering relationship with the outer surface **12*a*** of the hose **12** and the underside **16*d*** of the envelope **16** such that circumferential and longitudinal movement of the clamp is restricted. If the clamp **14** includes slots **14*d*** or the like formed in the band **14*b***, the continuity of the passage way **18** may be interrupted by the envelope extending through the slots and bonding with that portion of the outer surface **12*a*** of the hose **12** underlying the slots, as shown in FIG. **5**. The envelope **16** orients and retains the clamp with respect to the circumference and the ends of a hose, captures or encapsulates a portion of the clamp, and is bonded to the hose. The capture or encapsulation of a portion of the clamp **14** by the envelope **16** prevents the clamp from circumferentially rotating or axially moving with respect to the hose.

The method for forming the hose and clamp assembly is quick, easy, and employs well-known technology. The method is illustrated schematically in FIG. **6**. First, the hose **12** is formed using conventional rubber extrusion techniques typically utilized for the manufacture of such hoses. That is, the hose or tube may be extruded or molded and may be either reinforced or non-reinforced as the application requires. In a typical manufacturing process for the tube or hose, which is described by way of example and not limitation, the appropriate raw materials are assembled and formulated into a "batch" of elastomer. The elastomer "batch" is then extruded or molded to provide the desired hose or tube. The formation of the hose or tube is completed by curing or vulcanizing it to impart the desired flexibility, resiliency, elasticity and strength characteristics. The hose or tube can be cured on a mandrel if it is necessary to provide a contoured shape to the hose. Finally, the hose or tube, if necessary, can be trimmed to the appropriate size.

Following the formation of the hose or tube it is placed in a rubber mold or molding tool into which the clamp has been placed. The hose and clamp are oriented with respect to each other to the desired longitudinal and circumferential position.

XXX'093

The elastomeric envelope is formed by first loading the mold or tool with the stock or batch elastomeric material. Using conventional methods such as compression, injection or transfer molding, the batch material is forced into contact with the hose and clamp to form the envelope. The envelope is then cured and bonded to the hose by vulcanization. Alternatively, the envelope can be first vulcanized to cure the envelope and then adhesively bonded to the hose. Thus a retaining means wherein the lateral edges **16***c* of the envelope **16** are bonded to the outer surface **12***a* of the hose **12**, and where the envelope **16** adheres to and around and encapsulates or captures a portion the clamp **14** is provided.

If the clamp **14** is formed with at least one hole, notch, slot or perforation in the band or has a lug, socket, clamp screw housing or other protrusion, means for facilitating the capture or encapsulation of a portion of the clamp **14** by the envelope **16** is provided.

The tube or hose **12** and the envelope **16** are preferably formed of the same elastomeric material to facilitate the process of bonding one to the other. However, the hose or tube and the envelope can comprise different materials. Examples of suitable elastomeric materials include but are not limited to ethylene propylene terpolymer, butadiene acrylonitrile, chlorosulfonated polyethylene, chloroprene, epichlorohydrin, polyisoprene, styrene butadiene, chlorinated polyethylene, ethylene acrylic, polysiloxanes, fluorosilicones, polyacrylates, and fluorinated hydrocarbons.

The instant specification and claims are set forth by way of illustration and not limitation. Various modifications and changes may be made without departing from the spirit and scope of the invention. The claims are to be interpreted as broadly as the prior art will allow.

ethylene acrylic, polysiloxanes, fluorosilicones, polyacrylates, and fluorinated hydrocarbons.

19. A hose-and-clamp assembly according to claim **18** wherein the envelope is formed from an elastomer selected form the group consisting of ethylene propylene terpolymer, butadiene acrylonitrile, chlorosulfonated polyethylene, chloroprene, epichlorohydrin, polyisoprene, styrene butadiene, chlorinated polyethylene, ethylene acrylic, polysiloxanes, fluorosilicones, polyacrylates, and fluorinated hydrocarbons.

20. A hose-and-clamp assembly according to claim **12** wherein the circumferential dimension of the envelope is approximately 25% of the circumferential dimension of the hose.

* * * * *

United States Patent [19]
Yasuo

[11] **Patent Number:** XXX'X14
[45] **Date of Patent:** Nov. 28. 1988

FIG.1

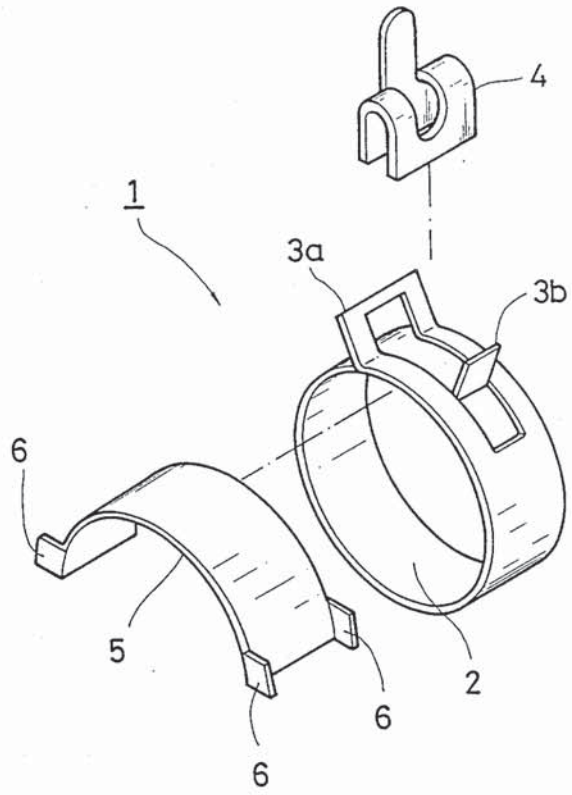


FIG.2A

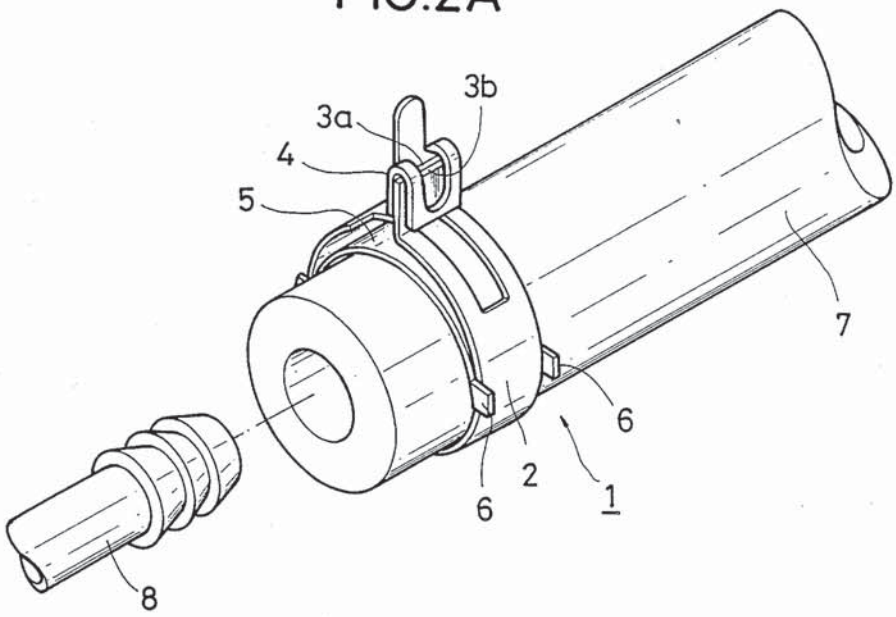


FIG.2B

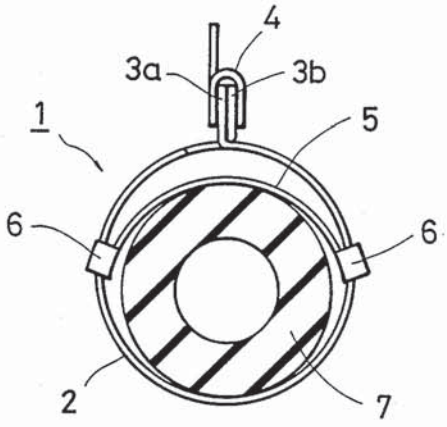


FIG.3A

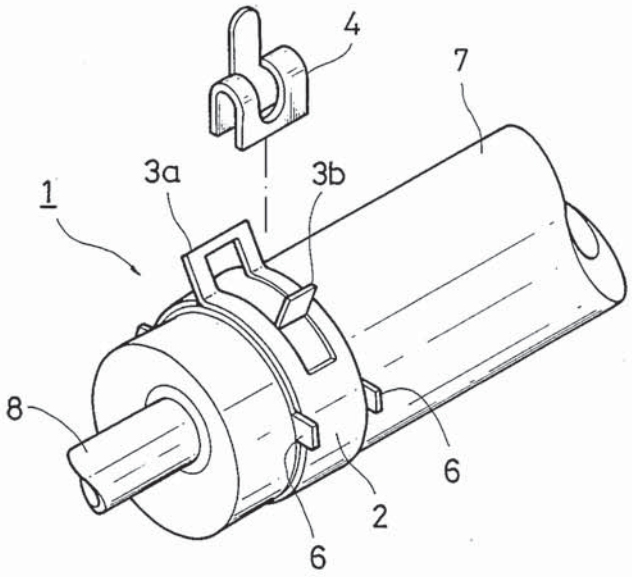


FIG.3B

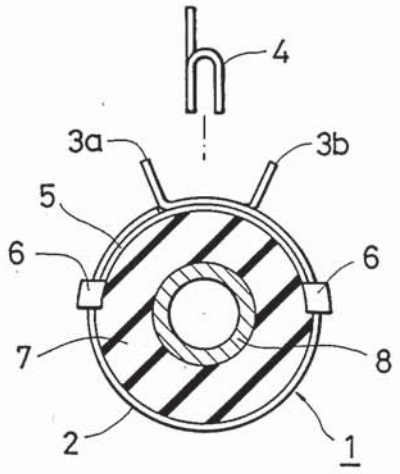


FIG.4

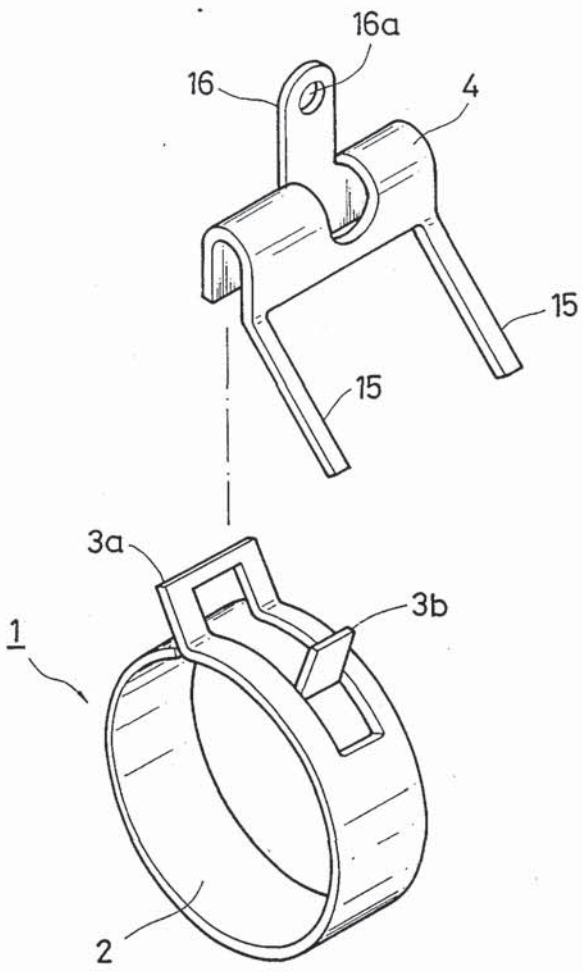


FIG.5A

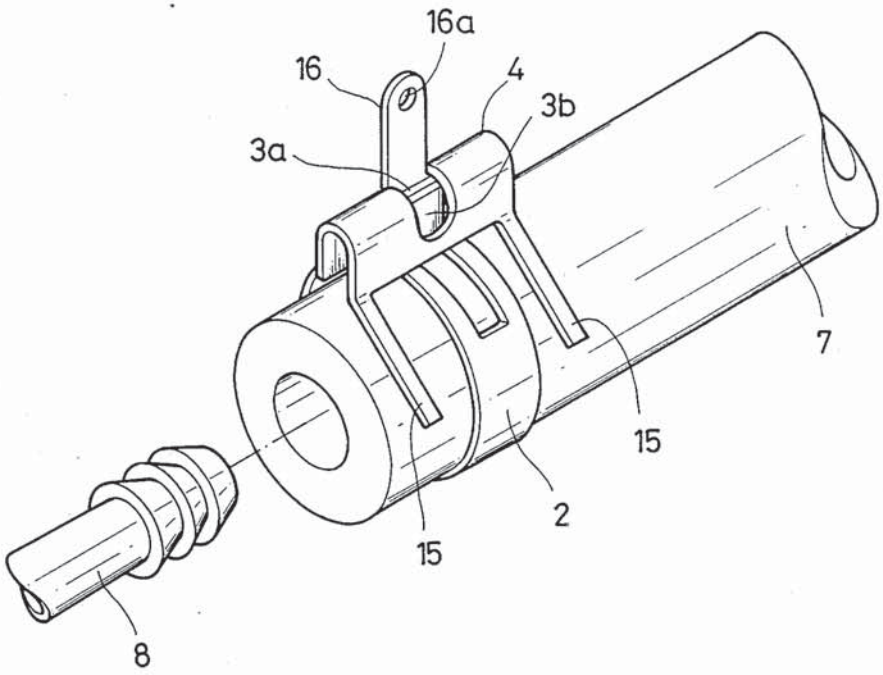


FIG.5B

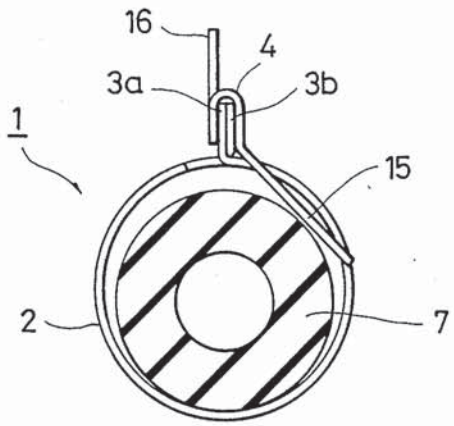


FIG.6

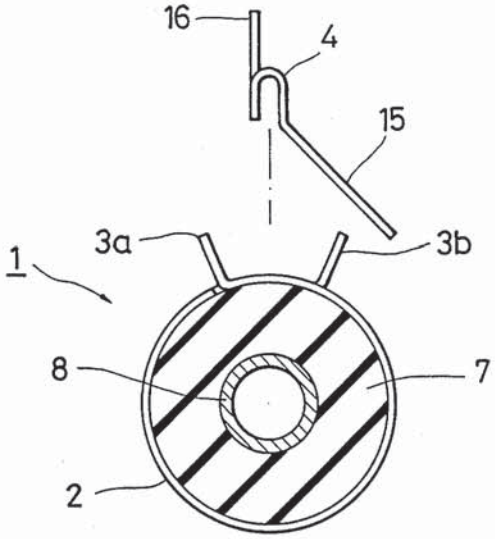


FIG.7A

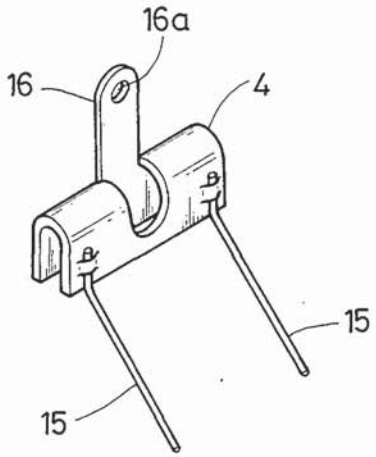


FIG.7B

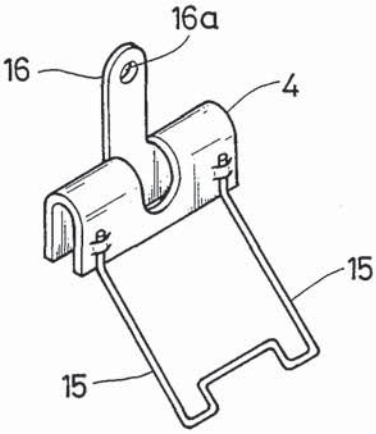
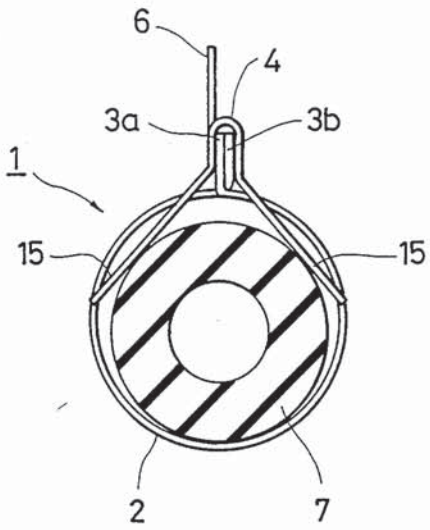


FIG.8



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HOSE CLAMP FURNISHED WITH TACKING FUNCTION

BACKGROUND OF THE INVENTION AND RELATED ART STATEMENT

This invention relates to a hose clamp used for binding in place a rubber hose, for example.

The hose clamps of this type which have come into use to date will be explained. First, the hose clamp disclosed in U.S. Pat. No. 3,008,206 is cited. In this hose clamp, a clamp body comprising an annular clamping ring part and a pair of grip parts is formed of a resilient wire of a circular cross section. This is the most primitive of all of the hose clamps. It has a problem in respect that when it binds a given rubber hose, it exerts a concentrated stress upon the bound portion of the rubber hose and accelerates the aging of the rubber hose.

As a solution for the problem, the hose clamp disclosed in U.S. Pat. No. 3,038,230 has been proposed. This hose clamp comprises a clamp body formed of a resilient flat sheet material and screw members adapted to link the opposite terminal parts of the clamp body, so that the binding force of the clamp body may be adjusted with the amount of helical engagement of the screw members. It is, therefore, capable of repressing otherwise possible concentration of stress upon the bound portion of a rubber hose. Conversely, however, it entails a disadvantage that the opposite terminal parts of the clamp body are required to allow for extra spaces for accommodation of the screw parts and that the assembly of the hose clamp requires an unduly large number of steps.

Thus, the hose clamps disclosed in U.S. Pat. No. 3,082,498, No. 3,106,757 and No. 3,295,176 have been proposed. These hose clamps invariably comprise an annular clamp body formed of a resilient flat sheet material and adapted to have part of the circular wall thereof projected outwardly in such a manner that when the opposite sides of the projected wall are squeezed toward each other with a jig, the clamp body is shrunk radially and allowed to exert a binding force upon the rubber hose. Therefore, they entail a disadvantage that since the amount of this radial shrinkage of the clamp body has its limit, the rubber hoses capable of being bound by these hose clamps automatically have their dimensional limits.

In recent years, therefore, the hose clamp disclosed in U.S. Pat. No. 4,305,179 has come to find increasing utility. In this hose clamp, a clamp body formed of a resilient flat sheet material cut in a prescribed shape comprises an annular clamping ring part and a pair of grip parts raised from the opposite terminal parts of the ring part and extended in mutually opposite directions. Owing to this construction, this hose clamp is capable of repressing the otherwise possible concentration of stress during the course of clamping to the fullest possible extent and allowing for appreciable freedom in the variation of the diameter of the clamping ring part.

In this hose clamp, however, during the course of the work of inserting a rubber hose inside the clamping ring part, the clamping ring part must be expanded radially by squeezing the pair of grip parts toward each other with a tool. The field workers have expressed a desire for this hose clamp to be improved so as to eliminate the inconvenience encountered in this inevitable work of imparting a radial expansion to the ring part.

As an answer to this demand, the hose clamp disclosed in Japanese Utility Model Publication No. SHO 52-14511 has been proposed.

In this hose clamp, a clamp body formed of a resilient flat sheet material cut in a prescribed shape comprises an annular clamping ring part for clamping a rubber hose and a pair of grip parts raised from the opposite terminal parts of the ring part and extended in mutually opposite directions. The hose clamp is separately provided with a holder formed in a U-shaped cross section and adapted to retain the pair of grip parts in a state approximated to each other in spite of their resilient force.

When this hose clamp is put to actual use, the clamping ring part is radially expanded in advance by inserting the holder around the pair of grip parts in a state urged toward each other, thereby temporarily retaining the grip parts in the state of mutual approximation. Then, the rubber hose is inserted into the radially expanded clamping ring part and fitted on the terminal part of a connection pipe. Now, the holder is removed from the pair of grip parts to relieve the pair of grip parts of their mutual approximation and allow the clamping ring part to shrink radially automatically by the resilient force of its own, with the result that the rubber hose is bound fast on the pipe infallibly.

This hose clamp, therefore, enjoys an advantage of extremely simplifying the work of insertion of the rubber hose inside the clamping ring part because the radial expansion of the clamping ring part due to the use of the holder facilitates impartation of the state of radial expansion to the clamping ring part. When the rubber hose given to be clamped happens to have a relatively small diameter, however, it is often observed that the clamp body fitted in place in advance is compelled to move unexpectedly on the periphery of the rubber hose during the insertion of the rubber hose of small diameter around the terminal part of the connection pipe.

Once this phenomenon takes place, the field worker is compelled, after having inserted the rubber hose around the terminal part of the pipe, to reset the unexpectedly displaced clamp body to the prescribed clamping point of the rubber hose. The hose clamp, therefore, entails a disadvantage that this work of resetting will greatly annoy the field worker.

OBJECT AND SUMMARY OF THE INVENTION

The main object of this invention is to provide a hose clamp which is furnished with a tacking function which is capable of effectively inhibiting the accidental displacement of the clamp body during the work of clamping.

To accomplish this object, this invention presupposes a hose clamp which comprises a clamp body including an annular clamping ring part for clamping a hose and a pair of grip parts for filling the role of radially expanding the ring part, and a separately formed holder capable of retaining the pair of grip parts in a state of mutual approximation. In addition to the basic construction, the hose clamp is provided with displacement inhibiting means such that when the hose is inserted inside the radially expanded clamping ring part, the inhibiting means comes into resilient contact with the surface of the hose and inhibits the clamp body from being accidentally displaced on the periphery of the hose.

This invention has the displacement inhibiting means formed of a repressing plate assuming a curved surface different in curvature from the clamping ring part of the

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clamp body, so that the repressing plate is attached slidably to the inner side of the clamping ring part and allowed to come into resilient contact with the surface of the hose.

This invention otherwise has the displacement inhibiting means formed of a repressing arm disposed in a state tilted from the holder. In this construction, the repressing arm is brought into resilient contact with the surface of the hose.

The above and other objects, characteristic features and advantages of the present invention will be described more specifically below with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view illustrating in an exploded state a hose clamp furnished with a tacking function, as the first embodiment of this invention.

FIG. **2A** is a perspective view illustrating the hose clamp in a state tacked to a rubber hose.

FIG. **2B** is a cross section illustrating the hose clamp in the tacked state.

FIG. **3A** is a perspective view illustrating a rubber hose in a state clamped with the hose clamp.

FIG. **3B** is a cross section illustrating the hose clamp in a state having the rubber hose clamped therewith.

FIG. **4** is a perspective view illustrating in an exploded state a hose clamp furnished with a tacking function, as the second embodiment of the present invention.

FIG. **5A** is a perspective view illustrating the hose clamp in a state tacked to a rubber hose.

FIG. **5B** is a cross section illustrating the hose clamp in a state having the rubber hose clamped therewith.

FIG. **6** is a cross section illustrating the hose clamp in a state clamping the rubber hose.

FIG. **7A** is a perspective view illustrating a holder using another version of repressing arm.

FIG. **7B** is a perspective view illustrating a holder using still another version of repressing arm.

FIG. **8** is a cross section illustrating yet another version of repressing arm in a state having the clamp body tacked to a rubber hose.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Now, the present invention will be described below with reference to various preferred embodiments illustrated in the accompanying drawings.

In the hose clamp contemplated as the first embodiment, similarly to a conventional hose clamp, a clamp body **1** formed of a resilient flat sheet material comprises an annular clamping ring part **2** and a pair of grip parts **3***a* and **3***b* adapted to fill the role of radially expanding the ring part **2** as illustrated in FIG. **1**. This hose clamp is further provided with a separately formed holder **4** by means of which the pair of grip parts **3***a* and **3***b* can be retained in a mutually approximated state. It is characterized by being provided, separately of the holder **4**, with a retaining plate **5** adapted to fill the role of displacement inhibiting means as described below.

Specifically in the first embodiment, the retaining plate **5** is formed of a resilient flat sheet material in the shape of a curved wall different in curvature from the clamping ring part **2**. The retaining plate **5** of the shape of a curved wall is provided along the opposite lateral edges in the terminal parts thereof with small integrally formed engaging pieces **6** adapted to engage with the

lateral edges of the clamping ring part **2** from outside. The retaining plate **2**, owing to the engagement mentioned above, is allowed to assume a state opposed to the crossing portions of the grip parts **3***a* and **3***b* and fitted slidably to the inner side of the clamping ring part **2**.

The use of the hose clamp constructed as described above in the clamping of a rubber hose **7** to the end part of a connection pipe **8** is effected, as practised heretofore and as illustrated in FIG. **2A**, by inserting the holder **4** around the pair of mutually approximated grip parts **3***a* and **3b**, thereby radially expanding the clamping ring part **2** forcibly, inserting the rubber hose **7** inside the radially expanded ring part **2**, and subsequently fitting the rubber hose **7** around the end part of the connection pipe **8**.

In the first embodiment, however, since the retaining plate **5** different in curvature from the ring part **2** is attached to the inner side of the clamping ring part **2** through the small engaging pieces **6** as described above, the retaining plate **5** comes into direct resilient contact with the surface of the rubber hose **7** and the clamp body **1** is allowed to be temporarily tacked to that portion of the hose **7** illustrated specifically in FIG. **2B** when the rubber hose **7** is inserted into the clamping ring part **2** by virtue of the resilient bending of the retaining plate **5**.

When the rubber hose **7** is inserted around the end part of the connection pipe **8** by virtue of the resilient contact of the retaining plate **5**, therefore, the accidental displacement of the clamp body **1** on the periphery of the hose **7** cannot take place and the clamp body **1** can be tacked from the beginning to the clamped portion of the hose **7**. Thus, the hose clamp of this invention has no use for the work of resetting the clamp body **1** to the clamped portion of the hose **7** which has been inevitably carried out heretofore.

Thereafter, the holder **4** is removed from the pair of grip parts **3***a* and **3***b* to relieve the pair of grip parts **3***a* and **3***b* of mutual approximation as illustrated in FIG. **3A**. Consequently, the clamping ring part **2** radially shrinks by virtue of the resilient force of its own and squeezes the outer peripheral surface of the rubber hose **7** infallibly. The hose **7**, therefore, is infallibly fastened to the end part of the connection pipe **8**.

Moreover, in this state of fast clamping, the retaining plate **5** is brought into direct surface contact with the surface of the rubber hose **7** as illustrated specifically in FIG. **3B** and is consequently enabled to squeeze the hose **7** with a uniform clamping force and, at the same time, prevent the crossing portions of the grip parts **3***a* and **3***b* from coming into contact with the surface of the hose **7**. Thus, without being partly nipped between the crossing portions of the grip parts **3***a* and **3***b*, the rubber hose **7** is liberated perfectly from the possibility of sustaining injury or yielding to deterioration.

In addition to bringing about the operation and effect described above, the interposition of the retaining plate **5** between the rubber hose **7** and the crossing portions of the grip parts **3**a and **3***b* serves to smoothen the displacement of the crossing portions of the grip parts **3***a* and **3***b*. Even when the rubber hose **7** suffers from loss of diameter by aging, the clamping ring part **2** is allowed to shrink radially easily in concert with the displacement of the crossing portions which follows the decrease of diameter. The possibility of the state of fast clamping being degrated by the aging of the hose **7**, therefore, is nil.

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Now, the hose clamp contemplated as the second embodiment of this invention will be described. The hose clamp of this embodiment, as illustrated in FIG. 4, presupposes a construction in which a clamp body **1** formed of a resilient flat sheet material comprises an annular clamping ring part **2** and a pair of grip parts **3***a* and **3***b* adapted to fill the role of radially expanding the ring part **2** and in which a holder **4** is adapted to play the role for retaining the pair of grip parts **3***a* and **3***b* in a mutually approximated state. This hose clamp is characterized by being integrally provided on the holder **4** itself with retaining arms **15** destined to serve as displacement inhibiting means.

Specifically in the second embodiment, the holder **4** itself is formed with a cross section of the shape of inverted U so as to be readily inserted around the pair of mutually approximated grip parts **3***a* and **3***b*. The holder **4** is further provided with a pair of retaining arms **15** extended and tilted with a fixed angle from the opposite end parts of one of the opposite lateral walls of the holder **4** having the cross section of inverted U. Owing to this construction, the pair of retaining arms **15** are allowed to have their inner sides brought into resilient contact with the outer surface of the hose **7**.

Further, in the second embodiment, a handling piece **16** of a relatively large area is integrally formed by partial punching or welding as raised from the other wall side of the holder **4**. When this large handling piece **16** is nipped and pulled up with a tool, the holder **4** can be easily removed from the grip parts **3***a* and **3***b*. By visual discernment of the presence or absence of this large handling piece **16**, it can be readily confirmed whether or not the holder **4** is still kept fitted on the grip parts **3***a* and **3***b*.

For the purpose of this confirmation as to the discrimination between the presence and the absence of the handling piece **16**, it is sufficient to give conspicuous largeness to the handling piece **16**. The handling piece **16**, when necessary for enhanced conspicuity, may be coated with a fluorescent coating material or formed of a reflecting sheet so as to impart ot the handling piece **16** an ability to reflect light. Alternatively, it is permissible to perforate in the handling piece **16** a hole **16***a* of a shape easy of visual identification.

The use of the hose clamp constructed as described above in the clamping of the rubber hose **7** to the terminal part of the connection pipe **8**, similarly to the hose clamp of the first embodiment, is attained by inserting the holder **4** having the cross section of inverted U around the pair of mutually approximated grip parts **3***a* and **3***b*, thereby radially expanding the clamping ring part **2** forcibly and inserting the rubber hose **7** inside the radially expanded ring part **2**.

In the second embodiment, however, while the holder **4** is kept fitted around the pair of grip parts **3***a* and **3***b*, the pair of retaining arms **15** extended from the opposite terminal parts of one lateral wall of the holder **4** come into resilient contact sideways with the outer surface of the hose **7**. Owing to the resilient contact, the inner sides of the pair of retaining arms **15** are brought into resilient contact with the peripheral surface of the rubber hose **7** and the clamp body **1** is temporarily tacked infallibly at that portion of the hose **7** as soon as the rubber hose **7** is inserted into the clamping ring part **2**.

Moreover, the retaining arms **15** are extended in a tilted state relative to the holder **4** so as to contact the outer surface of the rubber hose **7** and, as a result, the

inner sides of the tilted retaining arms **15** are brought into resilient contact with the outer surface of the hose **7**. Owing to the construction, the retaining arms **15** are allowed to have a large length. When the retaining arms **15** are formed with as large a length as possible, the inner sides of the retaining arms **15** come into resilient contact with the outer surface of the hose **7** infallibly and the clamp body **1** is allowed to manifest the tacking function to the fullest extent even if the diameter of the hose **7** being clamped is much smaller than that of the clamping ring part **2** in its radially expanded state.

The retaining arms **15** are allowed to have their own inner sides come into resilient contact sideways with the hose **7**. Even when the necessity arises for displacing the clamp body **1** on the peripheral surface of the hose **7**, therefore, smooth slide of the clamp body **1** on the hose can be guaranteed without entailing the possibility of inflicting injury upon the surface of the hose **7**.

In the second embodiment, therefore, the possibility of the clamp body **1** being accidentally displaced on the peripheral surface of the hose **7** during the insertion of the rubber hose **7** around the terminal part of the connection pipe **8** is completely eliminated. Thus, the clamp body **1** can be tacked from the beginning at the clamped portion of the hose **7**. The hose clamp of the second embodiment has absolutely no use for the work of resetting the clamp body **1** to the clamped portion of the hose **7** after the rubber hose **7** has been inserted around the terminal part of the pipe **8**.

Thereafter, the holder **4** is removed out of the pair of grip parts **3***a* and **3***b* with the aid of the holding piece **16**, as shown in FIG. **6**, to relieve the pair of grip parts **3***a* and **3***b* of the state of mutual approximation. Consequently, the clamping ring part **2** radially contracts by virtue of the resilient force of its own and squeezes the peripheral surface of the rubber hose **7** infallibly. Thus, the hose **7** is fastened infallibly to the terminal part of the connection pipe **8**.

When any of the holders **4** used during the course of the work of clamping a rubber hose **7** happens to remain unremoved from the corresponding clamp body **1**, since the handling piece **16** of a relatively large size is raised in a conspicuous manner from the other lateral wall of the holder **4** as described above, the presence of this handling piece **16** ensures easy confirmation of the fact that the holder **4** has not been removed. Thus, the possible occurrence of a clamp body **1** escaping due attention can be prevented without fail.

In the second embodiment described above, the retaining arms **15** adapted to manifest the tacking function are depicted as integrally formed by bending the same material as the holder **4**. The pair of retaining arms **15**, when desired for the convenience of use, may be formed separately of the holder **4** with a resilient wire material and the retaining arms **15** made of the wire material may be fastened to the prescribed portions on one lateral wall of the holder **4** by welding or the like means, as illustrated in FIGS. 7A and 7B.

Further, as illustrated in FIG. **8**, another pair of retaining arms **15** may be formed in the opposite terminal parts of the other lateral wall of the holder **4** and this pair of retaining arms **15** and the pair of retaining arms **15** on the first lateral wall may be brought into resilient contact sideways with the outer surface of the rubber hose **7**, when required for the convenience of use. In this case, the clamp body **1** can be tacked with enhanced certainty on the peripheral surface of the hose **7** because

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the tacking force produced in this construction is twice as large as in the second embodiment described above.

The hose clamp of this invention is characterized, as described above, by being provided with means capable of coming into resilient contact with the peripheral surface of the hose and prohibiting the clamp body from being displaced on the peripheral surface of the hose when the hose is inserted inside the radially expanded clamping ring part. Even when the hose being clamped happens to have a relatively small diameter, therefore, since the displacement inhibiting means is allowed to come into direct resilient contact with the peripheral surface of the hose being clamped and effect required tacking of the clamp body at the position, the possibility of the clamp body being accidentally displaced on the peripheral surface of the hose during the insertion of the hose around the terminal part of the connection pipe is completely eliminated.

Since the clamp body can be tacked from the beginning at the clamped portion of the hose, the hose clamp of this invention has absolutely no use for the work of resetting the clamp body to the clamped portion of the hose after the rubber hose has been inserted around the terminal part of the hose.

United States Patent [19]
Sidney

[11] **Patent Number:** XXX'X33
[45] **Date of Patent:** Sept. 12, 1992

FIG. 1

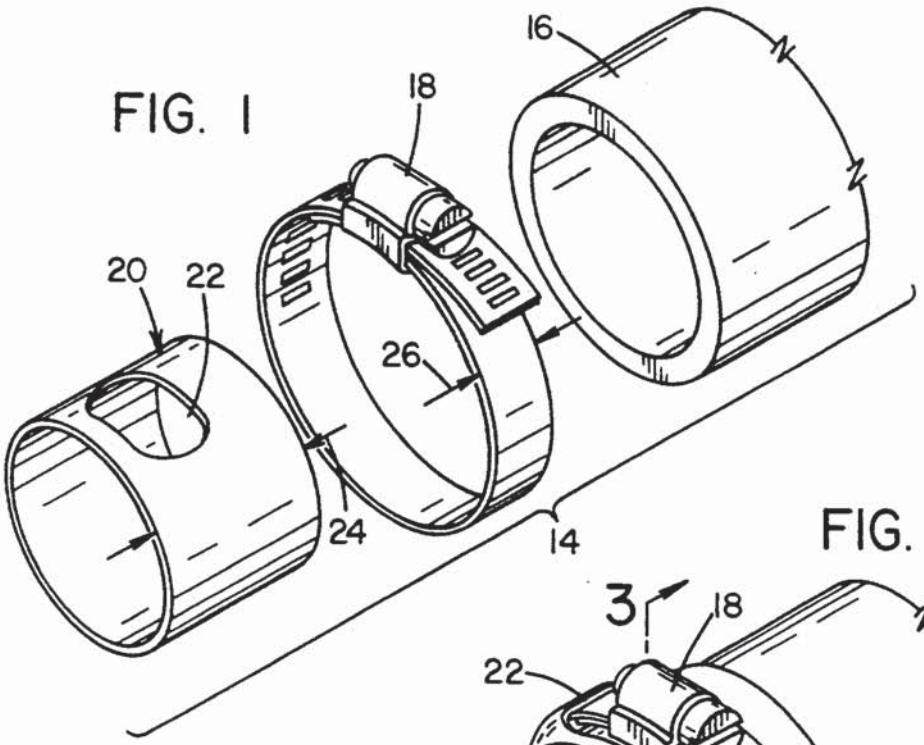


FIG. 2

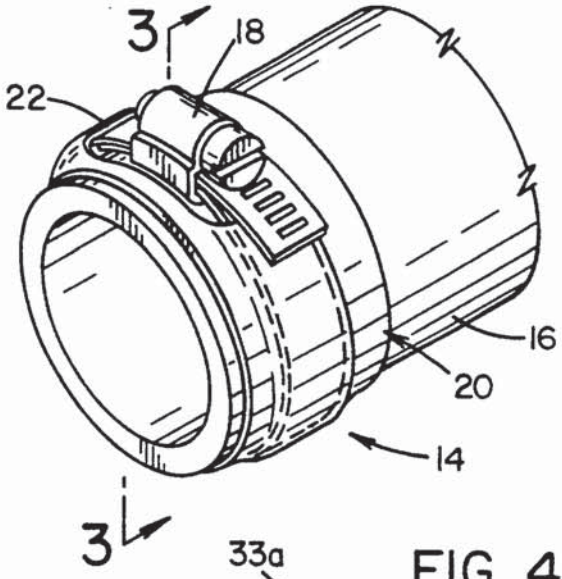


FIG. 3

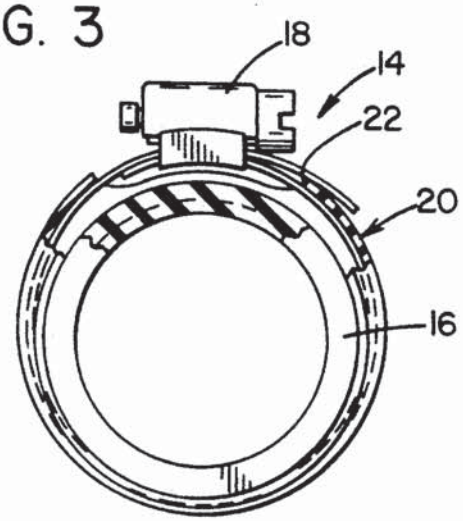


FIG. 4

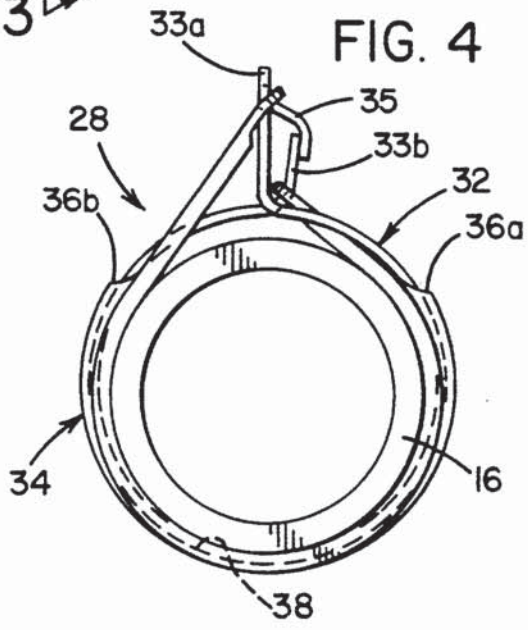


FIG. 5

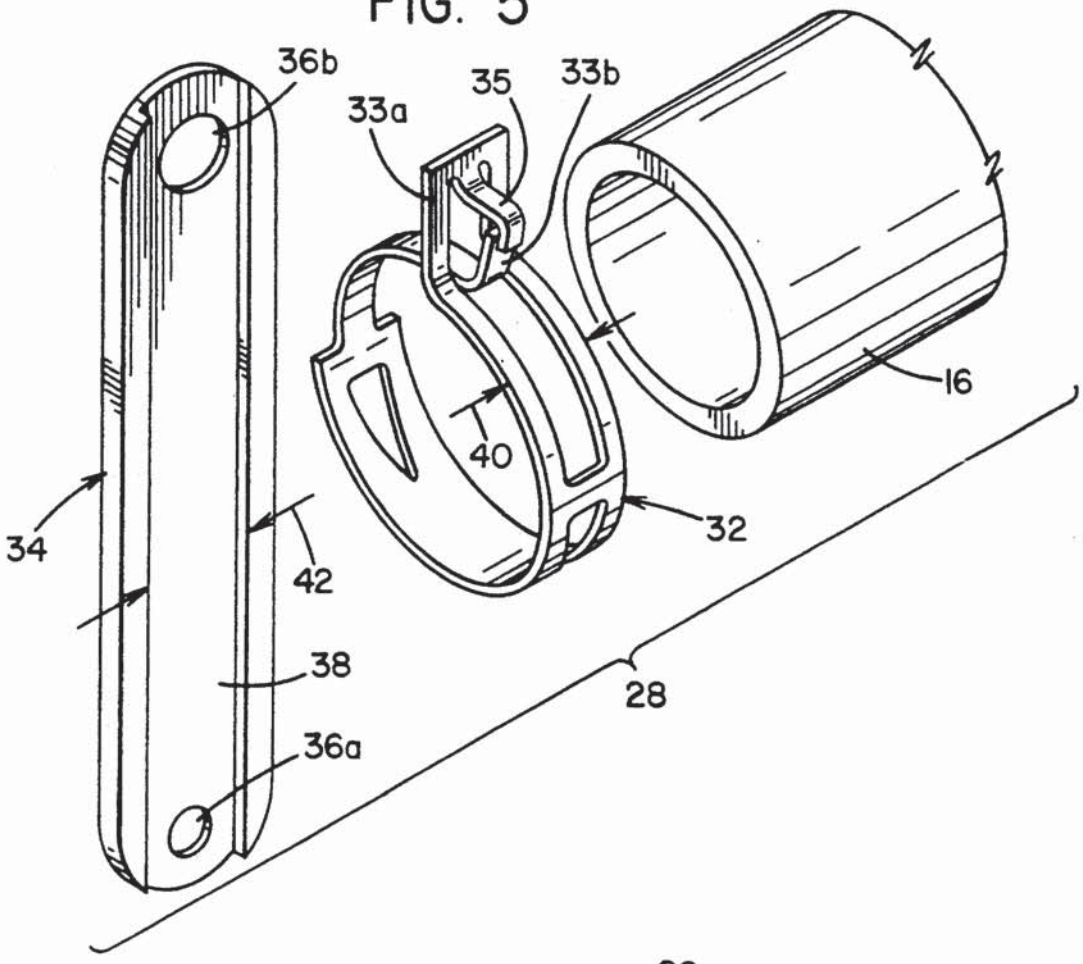

36b
35
33b
33a
16
40
34
32
42
38
28
36a

FIG. 6

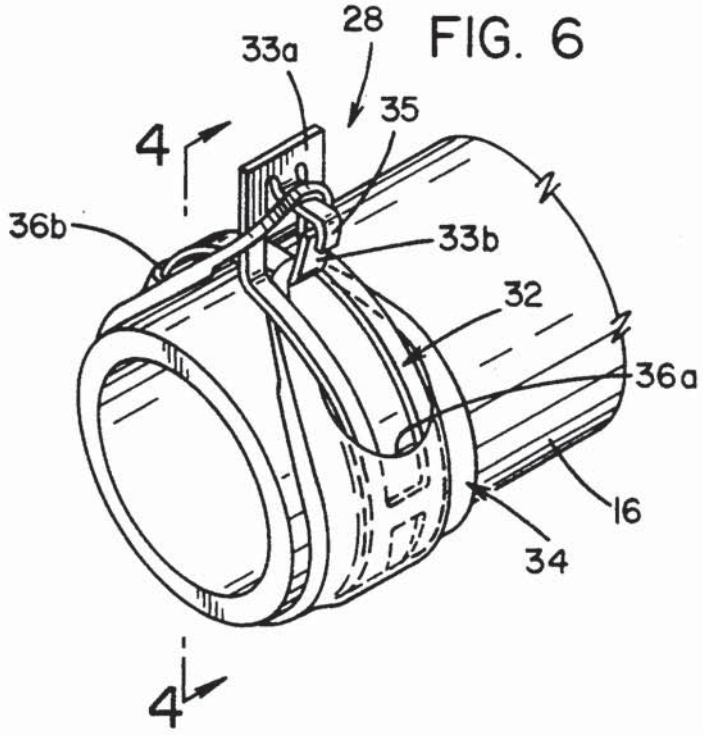
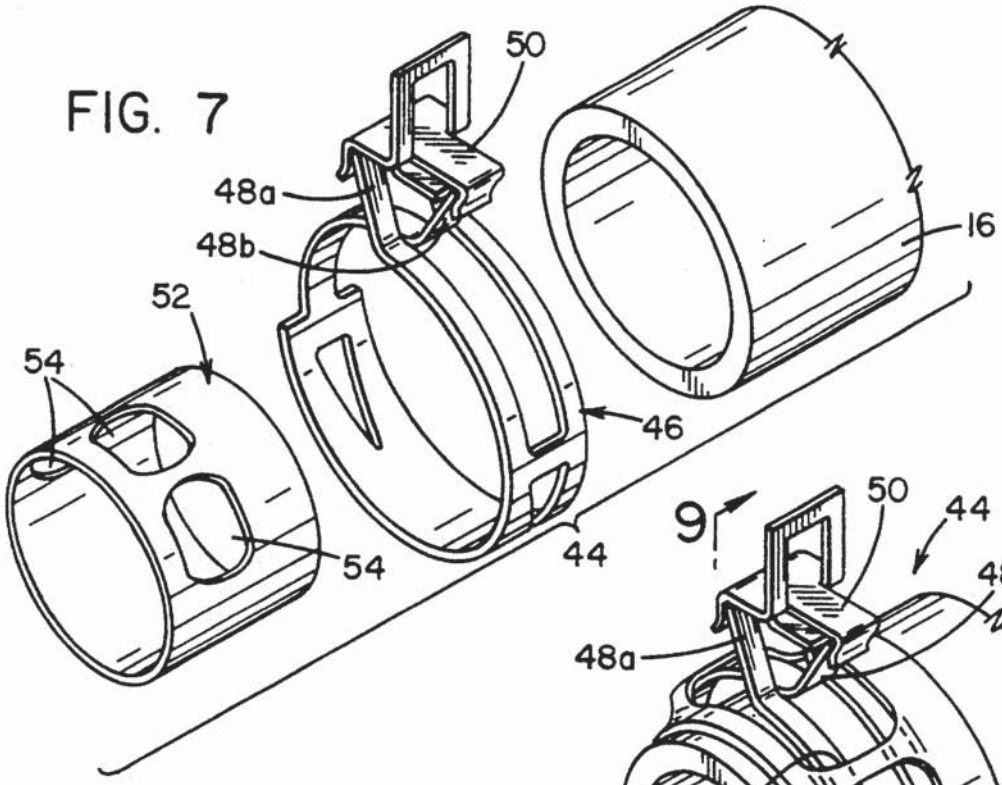
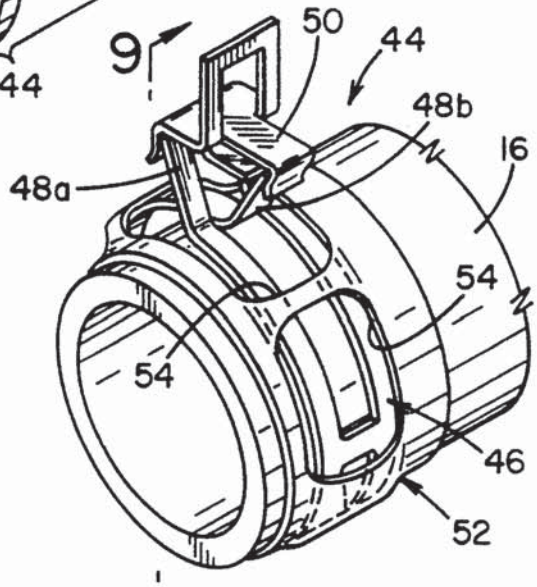

28
33a
35
4
36b
33b
32
36a
16
34
4

FIG. 7





9

FIG. 8

FIG. 9

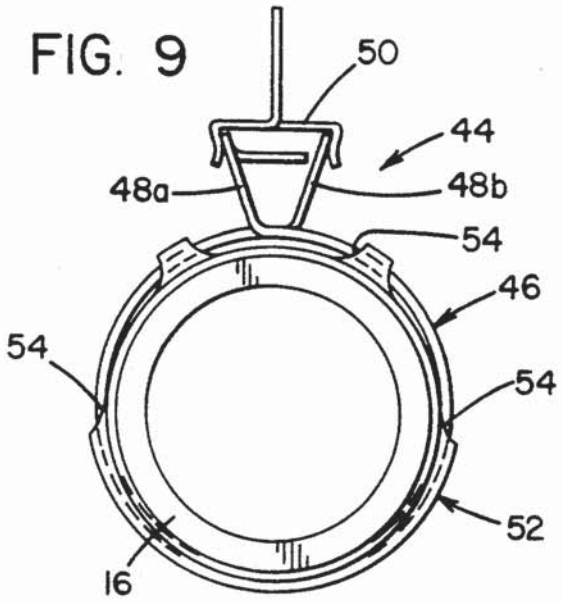
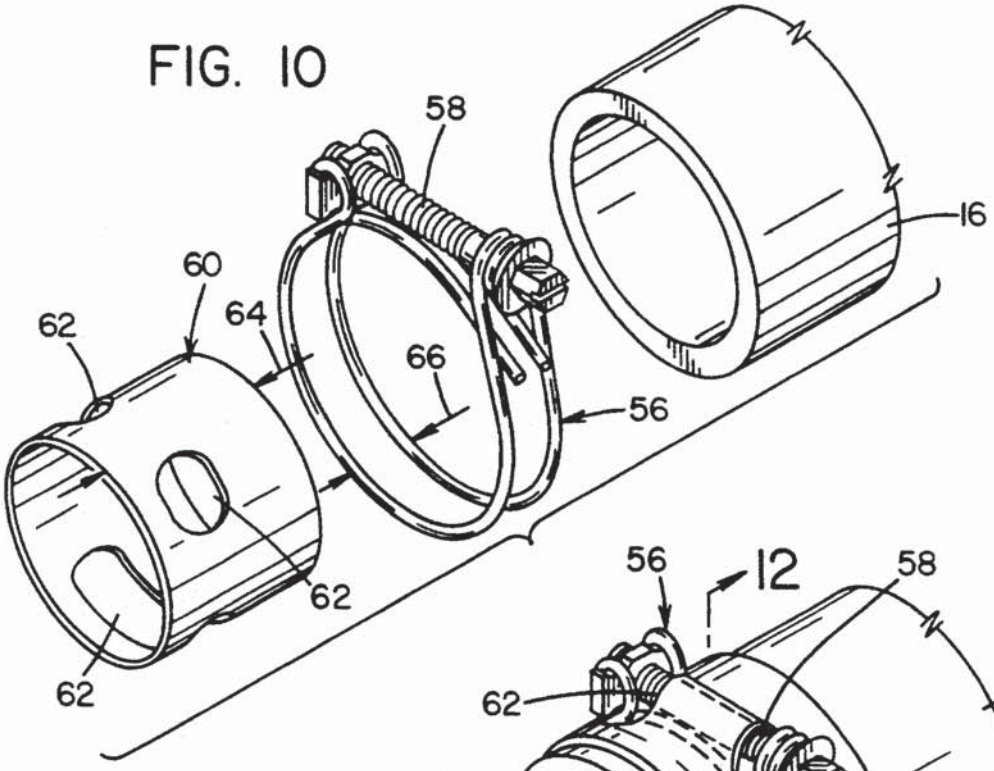


FIG. 10



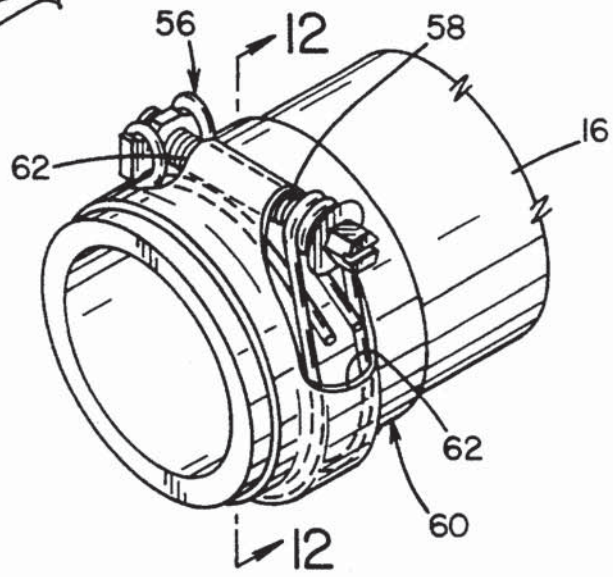


FIG. 11

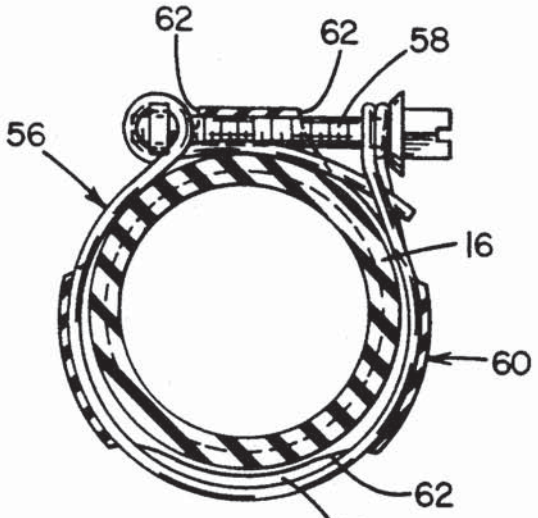


FIG. 12

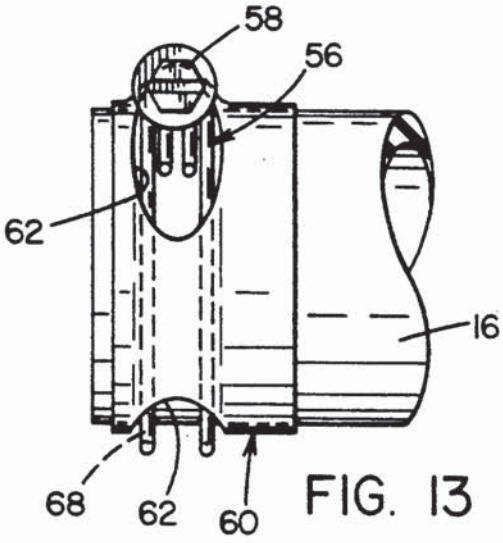


FIG. 13

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HOSE/CLAMP ASSEMBLY WITH RUBBER BAND HOLDER

FIELD OF THE INVENTION

This invention relates to hose/clamp assemblies. More particularly, it deals with a hose clamp which is held in its radially expanded or open position, located and oriented around a hose and secured to the hose.

BACKGROUND OF THE INVENTION

Various attempts have been made in the past to pre-assemble hose clamps on hoses. See, for example, U.S. Pat. No. 3,365,218 which describes and illustrates the use of a staple which penetrates into the hose. U.S. Pat. No. 4,882,814 shows the use of metallic retaining plates or arms. U.S. Pat. No. 5,002,094 employs a less than circumferential band of rubber which must be molded and vulcanized over a portion of the clamp. It is felt that this latter arrangement restricts the circumferential expansion of the hose and, thus, its assemblability over nipples in its end-use applications such as radiator and heater hoses in motor vehicle manufacturing.

There was, therefore, a need for a hose/clamp assembly which did not invade the integrity of the hose, provided positive retention of the clamp on the hose at a predetermined location and orientation and did not require additional operations such as molding and vulcanization.

According to the practice of the present invention, there is provided a hose/clamp assembly comprising:

a) a hose;

b) an annular hose clamp in its radially expanded open position placed around the hose in a predetermined location and orientation, and means for opening and closing; and

c) a rubber band having at least one aperture therein, surrounding the entire circumference of said clamp and hose with said means for opening and closing extending through said at least one aperture.

It is preferred that the rubber band has an axial width which is greater than the axial width of whatever type of clamp being use.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view, blown apart, of the components of a hose/clamp assembly.

FIG. **2** is a perspective view illustrating the final assembly of the components of FIG. **1**.

FIG. **3** is a cross-sectional view taken along line **3—3** of FIG. **2**.

FIG. **4** is a cross-section view taken along line **4—4** of the hose/clamp assembly of FIG. **6**.

FIG. **5** is a perspective view, blown apart, of the components of a hose/clamp assembly, illustrating another embodiment of the invention.

FIG. **6** is a perspective view of the assembled components of FIG. **5**.

FIG. **7** is a perspective view, blown apart, of the components of another embodiment of the present invention.

FIG. **8** is a perspective view of the assembled components of FIG. **7**.

FIG. **9** is a cross-sectional view taken along line **9—9** of FIG. **8**.

FIG. **10** is a perspective view, blown apart, of the components of another embodiment of the present invention.

FIG. **11** is a perspective view of the assembled components of the hose/clamp assembly of FIG. **10**.

FIG. **12** is a cross-sectional view taken along line **12—12** of FIG. **11**.

FIG. **13** is a side elevational view of the completed assembly of FIG. **11**.

DETAILED DESCRIPTION OF THE INVENTION

FIG. **1** illustrates generally at **14** one embodiment of the present invention comprised of a hose **16**, a hose clamp **18** and a rubber band **20** wherein the rubber band **20** has an aperture **22** therein. The width of the rubber band **24**, in an axial direction, is greater than the width **26** of clamp **18**. The clamp **18** is left in its open or untightened condition and located around the hose in a pre-determined orientation. The rubber band **20** is then stretched around the clamp such that the closing mechanism of the clamp **18** projects through the aperture **22** in the rubber band **20**. The clamp **18** is left open enough to allow the hose **16** to stretch over any lip that may be present on the nipple of the component to which the hose assembly is to be attached. The completed assembly is shown in FIG. **2** wherein the band **20** surrounds the clamp **18** to prevent axial or circumferential movement and allows the closing mechanism to be operated after the insertion of the nipple into the hose.

FIG. **5** illustrates generally at **28** the components of another embodiment of a hose/clamp assembly of the present invention. Clamp **32**, commonly known as a constant tension clamp, has a pair of tabs **33***a* and **33***b* which are held in their squeezed together open configuration by tang **35**. Rubber band **34** has a pair of apertures **36***a* and **36***b* and a recess channel **38** whose width **42** is greater than the width **40** of clamp **32**. To assemble this embodiment, tabs **33***a* and **33***b* are placed into one of the aperture **36** in rubber band **34**. This has the effect that the outer portion of the aperture is retained on tab **35***b*. The clamp is then placed over hose **16** and the other aperture of rubber band **34** is brought around the clamp **32** and hose **16** to engage tab **33***a* and tang **35** as illustrated in FIG. **6**. One advantage of this particular embodiment is that when the hose/clamp assembly is attached to a vehicle component by releasing tang **35** from tab **33***b*, the tensile forces from the stretched rubber band **34** are added to those of clamp **32** to provide a tighter fit.

FIG. **7** illustrates generally at **44** another embodiment of the present invention wherein clamp **46** is similar to clamp **32** in FIG. **5** having tabs **48***a* and **48***b* held in the opened position by clip **50**. Rubber band **52** has three apertures **54**. The completed assembly as shown in FIG. **8** is accomplished similarly to the embodiment shown in FIG. **2** wherein the clamp **46** is placed around and oriented on hose **16** and held in place by rubber band **52** having the tabs **48***a* and **48***b* as well as clip **50** protruding through one of the apertures **54**. As can be well appreciated, the assembly of the hose onto a vehicle is accomplished by merely removing the clip **50** after the hose has been inserted over a nipple. It has been found that the additional apertures in band **52** has helped to reduce the amount of tension being asserted by the band on the hose in order to prevent the hose from going out of round which would, thus, make its installation more difficult.

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FIG. **10** illustrates another embodiment of the present invention wherein clamp **56**, commonly known as a two-wire clamp, has a screw **58** which is used to open and close the clamp. Rubber band **60** has three apertures **62**. Band **60** has a width **64** which is greater than the width **66** of clamp **56**. One of the apertures **62** of the rubber band **60** is located at what will be described for orientation purposes only at the bottom in order to allow the wires of clamp **56** to be assembled with a space **68** in order that the screw **58** is kept in contact with the hose to prevent movement of the screw during assembly operations at the vehicle manufactures.

While certain representative embodiments and details have been shown for the purpose of illustrating the invention, it will be apparent to those skilled in this art that various changes and modifications may be made

therein without departing from the spirit or scope of the invention.