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PATENTS ACT 1952
APPLICATION FOR A STANDARD PATENT

GÖTE ESKIL YNGVE HOLMBERG, of
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Sweden.

hereby apply for the grant of a Standard Patent for an invention entitled:

"LOCKING TONGUE FOR VEHICLE SAFETY BELTS"

which is described in the accompanying provisional specification.

Details of basic application(s):

<table>
<thead>
<tr>
<th>Number</th>
<th>Convention Country</th>
<th>Date</th>
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<tr>
<td>8207069-9</td>
<td>Sweden</td>
<td>10th December, 1982</td>
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The address for service is care of DAVIES & COLLISON, Patent Attorneys, of 1 Little Collins Street, Melbourne, in the State of Victoria, Commonwealth of Australia.

Dated this 12th day of January, 1984.

To: THE COMMISSIONER OF PATENTS

(a member of the firm of DAVIES & COLLISON for and on behalf of the Applicant).

Davies & Collison, Melbourne and Canberra.
In support of the Application made for a patent for an invention entitled: "LOCKING TONGUE FOR VEHICLE SAFETY BELTS"

1. GöTE ESKIL YNGVE HOLMBERG, of Mailbox 2010, S-334 00 Anderstorp, Sweden

I do solemnly and sincerely declare as follows:

1. (a) I am the applicant for the patent
2. (a) I am the actual inventor of the invention
3. The basic application as defined by Section 141 of the Act was made in Sweden on the 10th December, 1982 by GöTE ESKIL YNGVE HOLMBERG

Declared at Anderstorp this 4th day of December, 1983

DAVIES & COLLISON, MELBOURNE and CANBERRA.
Claim 1. Locking tongue for vehicle safety belts forming a slot for the passage of the belt strap and having an engagement portion for co-operation with engagement means in a belt lock, wherein at least the engagement portion is made of unhardened drawn steel wire.
The following statement is a full description of this invention, including the best method of performing it known to me:-
LOCKING TONGUE FOR VEHICLE SAFETY BELTS

The invention relates to a locking tongue for vehicle safety belts, forming a slot for the passage of the belt strap and having an engagement portion for co-operation with engagement means in a belt lock.

Today, the locking tongues are generally made of stamped steel sheet, which is far from being ideal. Such a locking tongue is not only expensive to produce, because several work operations are required in order to impart to the locking tongue an acceptable finish and because the waste of material in the production is large, the locking tongue made of steel sheet is also relatively heavy, which is an evident drawback in retractor belts, because there must be arranged in the belt retractor a correspondingly heavy retraction spring.

In order to overcome primarily said drawbacks the invention provides a locking tongue of the kind referred to above which is based on completely novel concepts and wherein, according to the invention, at least the engagement portion is made of unhardened drawn steel wire. Preferably, the engagement portion is made of acidproof stainless steel.

Such a locking tongue can be made of standard material, viz. band steel and unhardened drawn steel wire, which can be easily procured and moreover can be procured at a lower price than the steel sheet generally used for the present locking tongues. Moreover, since no significant amount of waste material has to be allowed for in the manufacture, since the manufacture can be effected by relatively easy work operations in simple tools, since there are no sharp edges, since the risk of surface cracks (indications of fracture) arising in punched surfaces at hardening
is eliminated, and since the risk of surface imperfections is considerably less than when stamped pieces are concerned, such that the need of surface finishing will be considerably reduced, it is possible to produce locking tongues according to the invention at lower costs than those at which the present locking tongues of stamped steel sheet can be produced. Furthermore, the locking tongue according to the invention can be made stronger than a stamped locking tongue, because the wire will take up the tensile forces in the longitudinal direction thereof (the drawing direction), which means that the locking tongue can be made smaller in order to satisfy prescribed strength requirements. This in combination with the reduction of weight which is due to the construction of the locking tongue, leads to the consequence that the locking tongue can be made light and thus will be well suited for use in retractor belts. A further advantage worth mentioning is that the wire because it is not hardened, has some softness such that it can be bent or deformed when the vehicle safety belt is loaded, which under certain load conditions may help to eliminate stresses in the belt lock proper.

In order to explain the invention more particularly a number of embodiments will be described in detail below, reference being made to the accompanying drawings in which

FIG. 1 is a plan view of one embodiment of the locking tongue with a molding of plastic material, shown in cross-sectional view,

FIG. 2 is a cross-sectional view of the locking tongue proper along line II - II in FIG. 1,

FIG. 3 is a cross-sectional view along line III - III in FIG. 2,

FIGS. 4 and 5 are views similar to FIGS. 1 and 2 of a second embodiment of the locking tongue according
to the invention,
FIGS. 6 and 7 are views similar to FIGS. 1 and 2 of a third embodiment of the locking tongue according to the invention,
FIG. 8 is a cross-sectional view of a locking tongue according to the invention in a further embodiment thereof wherein the locking tongue is made of two parts,
FIG. 9 is a plan view of one part of the locking tongue in FIG. 8,
FIG. 10 is a plan view of the other part of the locking tongue in FIG. 8,
FIG. 11 is a cross-sectional view along line XI - XI in FIG. 9, and
FIG. 12 is a plan view of a still further embodiment of the locking tongue according to the invention, made of two parts:
In the embodiment according to FIGS. 1 to 3, the locking tongue according to the invention comprises a frame 10 of unhardened steel wire, preferably a wire of acidproof stainless steel. The wire has circular cross-sectional form and is bent to form an engagement portion 11 adapted to be inserted into a belt lock and to be engaged with the locking means of the belt lock. The ends of the wire frame are inserted into a socket 12 of cold-rolled band steel, which has U-formed cross section and forms apertures 13 in the limbs thereof, the apertures in one limb being located closer to the longitudinal centre of the socket and the apertures in the other limb being located closer to the ends of the socket. The ends of the wire frame are secured in the socket by applying the following method:
When the socket 12 has been stamped from cold-rolled band steel and the apertures 13 have been formed therein, the socket is bent to U-form with the limbs
spaced a distance which is about 1 mm larger than the
diameter of the wire 10. Then, the socket is hardened.
When the wire frame has been introduced into the socket,
the limbs are pressed against the wire 10 in a per-
cussion press, the material of the wire, which is con-
siderably softer than the material in the hardened
socket, penetrating into the apertures 13 such that
the ends of the wire are locked in the socket. Then,
the wire 10 is flattened at least in the engagement
portion 11 thereof such that the cross-sectional form
shown in FIG. 3 is imparted to this portion, the
material of the wire at the same time being cold-worked
and as a consequence thereof being made harder. The
hardness will be increased about 20%.

The locking tongue obtained in this manner then
is exposed to ball polishing to impart to the surface
of the wire 10 a high lustre; no chromium plating or
other surface finishing is necessary after such treat-
ment.

A body 14 of plastic material is molded on the
locking tongue and forms a slot 15 as well as a slot
16 for the passage of the belt strap. The bounding
surface 17 of the slot 15, along which the socket 12
extends, is the surface which has to transfer the force
from the belt strap to the locking tongue when the
vehicle safety belt in which the locking tongue is being
used, is loaded, and this force which is a pressure
force against the bounding surface of the slot, will be
transferred to the socket 12 via the plastic material
and thus to the locking tongue. The plastic material
accordingly is not used for taking up any tensile
forces and besides is not suited to do this. On the
contrary, the plastic material at the bounding surface
17 is loaded by pressure force only when said forces
are transferred from the strap to the locking tongue.
The belt strap is passed through the slot 16 to obtain some friction between the belt strap and the locking tongue so that the locking tongue when used in a retractor belt will come along with the belt strap when the strap is retracted by the belt retractor. The locking tongue is particularly well suited for use in retractor belts, because it can be made very light. It can have a weight which is about a quarter of the weight of a conventional locking tongue of steel sheet.

The ends of the wire 10 can be secured in the socket 12 also in the way described in the British patent specification 1,433,279 relating to a loop fitting for vehicle safety belts.

The engagement portion 11 can be formed in different ways depending on the type of the belt lock with which the locking tongue shall co-operate. In FIGS. 4 and 5 there is shown another embodiment wherein the end portions of the wire 10 form the engagement portion 11. They extend in parallel close to each other and are flattened. They form an aperture 18 for engagement with the locking means of the belt lock. In this case it is not necessary that the ends are secured to each other, because the engagement portion 11 when inserted into the belt lock, is prevented from moving apart by the lock housing proper which has sturdy side walls formed by a U-formed frame of steel sheet in the lock housing, which is the embodiment of belt locks generally applied.

FIGS. 6 and 7 show a third embodiment of the locking tongue, which is similar to that of the locking tongue in FIGS. 4 and 5 but is of the "arrow" type. In this case the aperture 18 is replaced by shoulders 19 for engagement with the locking means of the belt lock.

As mentioned above, the locking tongue according to the invention is advantageous inter alia because the wire 10 is unhardened and thus is relatively soft in
relation to a stamped locking tongue of steel sheet. Due to this softness of the locking tongue this can be bent or deformed, if this should be called for by the force geometry at loading of the vehicle safety belt in which the locking tongue is being used, when the belt is loaded. As a consequence thereof the stresses will be reduced which otherwise could arise in the belt lock. The embodiments according to FIGS. 9 to 12 are proposed in order to accentuate further this advantageous feature of the locking tongue according to the invention.

Thus, there is shown in FIG. 8 a locking tongue, the engagement portion 21 of which is made of wire of the same character as the wire 10 in the embodiments previously described, the wire being bent to rectangular form as shown in FIG. 10. The end portions 22 of the wire are bent perpendicularly to the plane of the engagement portion and form a head 23. The engagement portion is detachably connected to a stamped piece 25 of steel sheet in a slot 24 at the end portions 22, said stamped piece forming a slot 26 for the passage of the belt strap. The engagement portion can rock in relation to the stamped piece. However, due to the fact that a body of plastic material indicated by dot and dash lines 14 in FIG. 8 is molded on the stamped piece 25, the engagement portion is fixed to said piece. The force is transferred directly from the engagement portion to the stamped piece via the end portions 22 when the locking tongue is loaded, but the two parts of the locking tongue then can be angled in relation to each other under yielding of the molded plastic material.

In the embodiment according to FIG. 12, the connection between the two parts of the locking tongue is arranged in another way. The engagement portion 21' comprises a wire in the same manner as previously described, but has U-form with heads 27 at the ends of
the limbs. These heads are received by matching recesses 28 in the stamped piece 25 for transferring occurring tensile forces between the parts, and it is intended that the locking tongue in this case shall have a molded body of plastic material around the stamped piece 25 in the same manner as described with reference to FIGS. 8 to 10, in order to maintain the two parts in a fixed relative position.

In the embodiments according to FIGS. 9 to 12 there is included a stamped piece of steel sheet which makes these embodiments less attractive than the embodiments according to FIGS. 1 to 7. However, it should be noted that the entire stamped piece should be enclosed by a body of plastic material and therefore no considerable surface finishing of the stamped piece is required, which means that it is not necessary to work said piece extensively as in case of conventional locking tongues stamped in their entirety from steel sheet material.
CLAIMS
THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. Locking tongue for vehicle safety belts forming a slot for the passage of the belt strap and having an engagement portion for co-operation with engagement means in a belt lock, wherein at least the engagement portion is made of unhardened drawn steel wire.

2. Locking tongue as claimed in claim 1 wherein the wire is bent to form a closed configuration so as to extend at a portion thereof along the edge of the slot, which is loaded by pressure from the belt strap when exposed to tensile load.

3. Locking tongue as claimed in claim 2 wherein the end portions of the wire extend along said edge of the slot.

4. Locking tongue as claimed in claim 3 wherein the end portions of the wire are encompassed by a socket having U-formed cross section, the web of said socket facing the slot.

5. Locking tongue as claimed in claim 4 wherein the socket consists of cold-rolled band steel which has been hardened after having been bent to U-form.

6. Locking tongue as claimed in claim 5 wherein the limbs of the hardened socket form apertures and are pressed against the wire inserted into the socket, the wire material bulging into the apertures.

7. Locking tongue as claimed in claim 1 wherein the wire is initially of circular cross-sectional form and is flattened for cold-working of the wire at least in the engagement portion of the locking tongue.

8. Locking tongue as claimed in claim 2 wherein the end portions of the wire are arranged in parallel close to each other to form the engagement portion.

9. Locking tongue as claimed in claim 2 wherein the wire at the portion which extends along said edge of the slot, is enclosed in a molded plastic material.
forming said slot.

10. Locking tongue as claimed in claim 1 wherein the wire forms the engagement portion only and is connected to a stamped piece of steel sheet forming said slot, by a connection transferring tensile forces.

11. Locking tongue as claimed in claim 10 wherein the connection between the engagement portion and the stamped piece is fixed by a molded body of plastic material enclosing said connection.

12. Locking tongue for vehicle safety belts, substantially as hereinbefore described with reference to the accompanying drawings.

13. The steps or features disclosed herein or any combination thereof.

DATED this 1st Day of March, 1984

GÖTE ESKIL YNGVE HOLMBERG
By His Patent Attorneys
DAVIES & COLLISON