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<p>(54) Title: A FIXING DEVICE FOR SECURING CONDUITS TO SUPPORT STRUCTURES</p>		
<p>(57) Abstract</p> <p>A fixing device for securing elongate articles such as conduits to a support structure, especially to cableways/cable risers, consisting of a clamp comprising a clamp opening (1a) provided with a U-shaped jaw (1) having attaching members (6, 7) for interaction with complementary attaching members in the support structure, a closure means comprising a closure arm pivotally mounted at the mouth of the clamp opening (1a) for the retention of conduits placed in the clamp opening (1a). The closure arm is formed by a ratchet arm (3) pivotally mounted by one of its ends (3a) at one side of the clamp opening (1a) near the mouth thereof, and the second free end of which forms an engaging end (3b), and is designed for snap engagement with a locking member (2) of complementary configuration at the opposite side of the clamp opening (1a) for pressing the conduit into the clamp opening (1a) and retaining it therein, and the attaching members (6, 7) are provided on the side of the jaw (1) opposite the mouth of the clamp opening (1a) and comprise projecting hooks (6, 7) with hook openings (6a, 7a), facing either towards or away from each other, for engagement with said complementary attaching members in the support structure, e.g., edges of the apertures (13) in the cableway/cable riser (14).</p> <div data-bbox="973 1220 1340 1892" style="text-align: right;"> </div>		

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## A FIXING DEVICE FOR SECURING CONDUITS TO SUPPORT STRUCTURES

5 The present invention relates to a fixing device for securing elongate articles such as conduits to support structures, in particular cableways/cable risers, and of the kind that is disclosed in the preamble of the independent claim 1 hereinbelow.

10 When mounting elongate articles such as conduits on underlying support structures such as cableways and cable risers, in structures at sea and on land, the conduits are secured and held in place by means of conduit clamps. In their simplest  
15 form, such clamps consist of a u-shaped body attached by the side edge at the bottom of the U-opening to the support structure by means of screws and nuts or by means of hooks which are brought into engagement with holes, slots or edges in the support structure.

20 Conduit clamps of this kind ought to be easy to mount to the underlying support structure and also ought to be easy to release to enable a change in position or the removal of the clamps to be carried out during the relaying of pipelines or  
25 the moving thereof, and optionally for installing cables which require other fixing devices.

The objective of the present invention is thus to provide a fixing device in the form of a clamp which firstly can easily  
30 be adapted to different conduit dimensions and where the securement and release of the conduit are such that the objective of providing a clamp which is easy to mount on the support structure and is also easy to dismount therefrom is attained.

35 The above desired objectives are, according to the invention, fulfilled by means of the characteristic features which are

disclosed in the characterizing clause in independent claim 1 hereinbelow and also in the subsequent dependent claims.

The invention will be explained in more detail hereinbelow with reference to the drawing which illustrates an exemplary embodiment of the fixing device according to the invention and which also shows how said device is mounted and how the conduit is positioned in the clamp of the fixing device.

Reference is now made to the drawing wherein:

Figure 1 is a perspective view of the fixing device seen at an angle from above with the jaw and the ratchet arm taken apart from one another and with the resilient movable attaching member locked in the engagement position by means of an eccentric member turned to the closure position by means of an operating arm, said operating arm also being indicated in dotted lines with the eccentric member in the passive position.

Figure 2 shows the same as figure 1 with the ratchet arm mounted in the passive position and operating arm in the upwardly pivoted passive position.

Figures 3a and 3b illustrate an embodiment of the ratchet arm in perspective seen from above and below, respectively.

Figures 4a and 4b are perspective views of the locking member seen looking towards the locking teeth and seen from behind.

Figure 5 depicts the clamp of the fixing device in section seen looking towards the main surface of the clamp and the clamp opening and with the ratchet arm and operating arm of the attaching member in passive positions.

Figure 6 illustrates the fixing device mounted on an underlying support structure in the form of a cableway, a fragment of which being shown in cross-section, with the operating arm in

the active position and with the conduit positioned in the clamp opening and with the ratchet arm in the active position for retaining the conduit, and also a further fixing device mounted on top of the first fixing device with a conduit placed therein that is of smaller dimension than the first-mentioned  
5 conduit and with the ratchet arm in a second active retaining position.

Figures 7a, b, c, d and e illustrate as follows:

10 a: the fixing device in perspective in the passive position ready for mounting on to the cableway,

b: the fixing device mounted by means of attaching members in slots in the cableway and with the operating arm pivoted down to hold the first attaching member in the form of a hook in  
15 engagement with an edge of a slot whilst the second attaching member in the form of a hook is in engagement (not shown) with the edge of a second slot parallel to and spaced apart from the first slot,

18 c: the fixing device mounted and a conduit placed therein and with the ratchet arm in the passive position,

20 d: the same as c, but with the ratchet arm in the active position for retaining the conduit, and

e: a further fixing device mounted on top of the first fixing device secured to the cableway, the attaching members of the  
25 second fixing device being brought into engagement with the holes on each side of the mouth of the clamp opening.

Figure 8 shows a side wall element of the jaw of the clamp.

30 Figure 9 illustrates a second design of said side wall element comprising the locking member for the ratchet arm, said locking member constituting a portion punched out of the side wall element which, in the mounted position, projects into the jaw/housing.

35 Figure 10 shows an alternative design of the clamp of the fixing device in perspective where the jaw comprises two jaw

portions which are rotatable in relation to one another so that on rotating said jaw portions relative to one another, the distance between the attaching members is altered.

5 Figure 11 shows the fixing device seen from the side.

Figures 12 a - d show the fixing device seen from the side in section and where

10 a shows the jaw portions rotated apart from one another for the insertion of attaching members in apertures in the underlying support structure,

b shows said jaw portions rotated into the operative position with the attaching members in engagement with apertures in the underlying support structure,

15 c illustrates the fixing device in the operative position with the conduit of the largest dimension that can be used with the fixing device held in place, and

d shows the same but with a conduit of the smallest dimension that can be retained in the fixing device.

20 Figure 13 illustrates a fixing device in perspective as in figure 10, but here the clamps of the fixing device have inwardly hook-shaped attaching members in contrast to the outwardly hook-shaped attaching members in figure 10.

25 Figures 14a - c are side views of the fixing device according to figure 13 in section and where

30 a shows the jaw portions rotated away from one another for the insertion of the attaching members of the fixing device into apertures in the underlying support structure,

b shows the same with the jaw portions rotated into the operative position and with the attaching members in engagement with the edges of the apertures, and

35 c shows the same as b, but with the ratchet arm in engagement with the appurtenant locking member,

Figures 15a - c illustrate details on a larger scale of the

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clamping members with which the jaw portions are provided in order to hold these in the operative position after on the underlying support structure, and

5 figures 16a and b show two fixing devices mounted one on top of the other with the lowermost fixing device mounted on an underlying support structure, and enlarged details of the clamping members with which the two jaw portions of the fixing device are provided.

10 Figure 1 shows, as stated above, the fixing device, hereafter in the specification referred to as the clamp, in perspective and comprising a jaw 1 in the form of a housing with two side walls 1b,1c which face one another and two walls having a clamp opening 1a which in figure 1 are shown in the form of a front wall 1e and a back wall 1d, said walls together forming a  
15 housing which in said figure is open in the upwards and downwards direction.

20 The jaw 1, at its lowermost part in the drawing, is provided with attaching members 6,7 for interaction with complementary attaching members in the underlying support structure, such as elongate apertures 13 in a cableway/cable riser 14.

25 The attaching members 6,7 will be discussed in more detail hereinbelow.

A closure means 2,3 comprises a ratchet arm 3 pivotally mounted at one end 3a to one of the sides of the clamp opening 1a near  
30 its mouth. The second end/engaging end 3b of the ratchet arm 3 is designed for snap engagement with a locking member 2 of complementary configuration at the opposite side of the clamp opening 1a for pressing a conduit R into the clamp opening 1a and retaining it therein (see figures 6 and 7).

35 The locking member 2 is arranged so as to be resiliently tensioned in the direction of the clamp opening 1a for

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resilient abutment against the engaging end 3b of the ratchet arm 3 when in its inwardly pivoted active position, as shown in figures 6 and 7d and e.

5 The locking member 2 and the engaging end 3b of the ratchet arm 3, in the illustrated embodiment, are designed with a plurality of projections/teeth 2a,3c for engagement with one another in the desired position, dependent upon the outer dimension of the conduit R, as is shown clearly in figures 2 and 6.

10 To guide the locking member 2 in its resilient movement towards the engaging end 3b of the ratchet arm 3, the locking member 2, which in the present embodiment and as shown in figure 4, has the form of a curved body having teeth 2a on its concave side, is equipped with two parallel, elongate guiding traces  
15 2b, spaced apart from one another in the side surfaces of the locking member 2, which are through-going and are designed to interact with two guiding pins 8 secured in the front wall 1e and the back wall 1d of the jaw 1. The guiding pins 8 and the  
20 guiding traces 2b are positioned and oriented in such a way that by means of a locking spring 4 in the form of a bent laminated spring attached to one side wall 1c and the jaw 1 and to the locking member, respectively, said locking member can be moved/pressed in the direction towards the engaging end 3b  
25 of the ratchet arm 3 in its inwardly pivoted closure position (see figures 4, 5 and 6).

The aforementioned attaching members 6,7 of the conduit jaw are arranged on the side 1b of the jaw 1 opposite the mouth of the clamp opening 1a and comprise projecting hooks 6,7 with hook  
30 openings 6a,7a facing either towards and or away from one another for engagement with complementary attaching members in the underlying support structure, for example edges in elongate apertures 13 in the cableway/ cable riser 14, as shown in  
35 figures 6 and 7.

When said hook openings 6a,7a face away from one another and

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are secured either end of the side of the jaw 1 opposite the mouth of the clamp opening 1a, ie, in the drawing the lowermost open side edge of the jaw 1, the hooks 6,7 of the clamp can be thrust down into the elongate apertures 13 in the cableway with the clamp slightly askew in relation to said apertures 13, whereafter the clamp can be rotated into a position at right angles to said elongate apertures 13 so that the hooks 6,7 engage with the underside of the edges of the aperture 13.

A more expedient design is however shown in the drawing, wherein one hook 6 is provided so as to be resiliently movable so that the clamp can be both mounted onto and dismounted from the attaching members in the underlying support structure, such as said elongate apertures 13.

Such resilient mobility of the hook 6 is obtained in that the hook 6 with a stem 5 consisting of spring steel is secured by the end facing away from the hook 6 to the inside of one of the side walls 1b of the jaw 1.

Providing that the hook 6 with the stem 5 lies resiliently in abutment against the inside of said side wall 1b, the clamp can be mounted in said elongate apertures 13 in that the resilient hook 6 is inserted into the elongate slot 13, whereafter the clamp is displaced with the stem 5 of the hook towards the edge of the slot, whereupon the hook 7 at the other end of the clamp is inserted into a parallel slot 13 and in under the edge thereof whilst the resilient hook 6 springs back into position.

When using this method of attachment, the clamp can, however, be released unintentionally in that force is exerted upon the clamp which displaces it towards the spring tension of the hook 6 in such a way that the fixed hook 7 can be forced up out of the aperture 13. In order to prevent this, the clamp is equipped with a lock 10 for the hook 6, comprising an eccentric member 11 with operating arm 12, mounted on the jaw 1. The

eccentric member 11 can be turned by means of operating arm 12 from the passive position where the hook 6 with stem 5 lies in the withdrawn position as shown in figure 5. This will happen provided that the stem 5 of the hook 6 is bent away from the inside of the side wall 1b of the jaw 1.

By pivoting the operating arm 12 downwards, the eccentric member 11 is rotated and presses the stem 5 of the hook 6 in towards the the inside of the side wall 1b, whereupon the hook 6 is swung outwards and into engagement under the side edge of the aperture 13. Thus the clamp will not be capable of being moved sideways by the pressure of any force and will be securely held against the support structure.

The mounting of the clamp on the cableway and the positioning of the conduit in said clamp is clearly shown in figures 7a, b, c, d and e. The clamp is secured by means of the hooks 6,7 in the aforementioned elongate apertures 13 in the cableway/cable riser 14, whereupon the operating arm 12 is pivoted downwards so that the movable hook 6 is displaced in under the edge of the aperture 13, whereby the clamp is securely fixed to the cableway as shown in b. The conduit R is placed thereafter in the opening of the clamp 1a as shown in c and the ratchet arm 3 is pivoted downwards so that its engaging end 3b, that is provided with teeth 3c, enters into engagement with the locking member 2, as is shown in d. The clamp can receive and retain the conduit R of varying dimensions in that the ratchet arm 3 is depressed to a lesser or greater extent, depending upon the dimensions of the conduit, into engagement with the locking member 2, as is shown in figure 6.

As shown in figure 7e, an additional clamp can be placed on top of the clamp that is secured to the cableway 14. The same attaching members 6,7 are used here in interaction with holes 9 in each of oppositely positioned side walls 1b,1c of the jaw.

The jaw 1 can be made for instance in that a blank is punched out which comprises the front wall 1e, the back wall 1d with the intermediate side wall 1b. Said blank is bent upwards so that said front wall, back wall and one side wall are formed. The second side wall 1c can be produced separately, as shown in figure 8, and affixed in the open side edge of the upwardly bent blank in a known way, per se. Said side wall element 1c is, as shown in figure 8, equipped with said hook 6 at its lowermost end and with said hole 9 at its uppermost end.

Instead of making the jaw 1 as a housing with a front wall, a back wall 1e, 1d and two side walls 1b, 1c, the jaw can consist of a plate (not shown) having a clamp opening 1a and with the aforementioned elements such as the ratchet arm 3 and the locking member 2 positioned on the plate. The same applies also to the attaching members 6, 7 for securing the clamp to the support structure.

Instead of a resilient locking member 2, the engaging portion of the ratchet arm 3 can be arranged resiliently so that on pivoting down towards the fixed locking member 2, the engaging end 3b will give way to, for example, a telescopic device on the ratchet arm 3 such that the engaging end 3b is pressed to abutment against the locking member 2 having teeth 2a.

An alternative embodiment of the locking member 2 may be that it is made of a punched-out portion of one side wall 1c of the jaw 1, as is shown in figure 9. The punched-out portion here has been pivoted inwards in the jaw or the housing formed thereby in order to interact with the ratchet arm 3. The desired resilience arises in that the locking member 2 acts as a resilient arm attached to said side wall 1c. The parts are preferably made of stainless steel thereby also having resilient properties.

In an alternative embodiment of the clamp as shown in figures 10 to 16, the two oppositely positioned side parts of the clamp

opening 1a are made of two jaw portions 1', 1'' that are rotatable relative to one another with the point of rotation A at the lower edge of the clamp opening 1a. This means that the jaw 1 consists of two jaw portions 1', 1'' that are rotatable relative to one another. On relative rotation of the jaw portions 1', 1'', the distance between the attaching members 6,7 is altered such that these can be inserted into the apertures 13 in the cableway/cable riser 14 in order thereafter to cause engagement between the hook-shaped attaching members 6,7 and the edges of the apertures 13 by rotating the jaw portions 1', 1'' back into the operative position. The jaw portions 1', 1'' can be retained in said operative position by means of the clamping members of the clamp, viz, the ratchet arm 3 and the locking member 2 which, when in engagement with one another, press the jaw portions 1', 1'' towards and away from one another, respectively, in order to hold the hook-shaped attaching members 6,7 in engagement with the edges of the apertures 13.

As shown in figures 10, 11 and 12, the hook openings 6a,7a of the hook-shaped attaching members 6,7 face away from one another.

In this case, the jaw portions 1', 1'' will be rotated apart from one another to reduce the distance between the attaching members 6,7 for insertion into the apertures 13. Thereafter the jaw portions 1', 1'' are rotated once more towards one another whereby the hook openings of the attaching members 6,7 are brought to abutment and engagement with the edges of the apertures 13.

In another embodiment of the attaching members 6,7, the hook openings thereof can face towards one another as is shown in figures 13 and 14. On mounting the clamp on the support structure, the jaw portions 1', 1'' must be rotated towards one another in order to increase the distance between the attaching members 6,7, whereupon these are inserted into the apertures

13, whereafter the jaw portions 1', 1'' are rotated back to the operative position whereby the hook openings 6a,7a of the attaching members 6,7 are brought into engagement with the side edges of the apertures 13.

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Here, the jaw portions 1', 1'' can also be held in the operative position by means of the ratchet arm 3 and the locking member 2 in that the ratchet arm 3 is brought into engagement with the locking member 2 and presses the jaw portions 1', 1'' apart from one another.

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As shown in figures 12 and 14, respectively, and also in figure 16, the clamping members are made of complementary closure members 15,16 provided on each jaw portion 1', 1''.

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The complementary closure members 15,16 can, as shown in said figures, be made of a projection/tongue 15 on the first jaw portion 1' and an indentation/aperture 16 on the second jaw portion 1'', or vice versa.

20

Thus, in figure 12, the tongue 15 of the closure member is made of a resilient projection/laminate spring attached to the side wall of the jaw portion 1' and which in the closed position engages with an indentation 16 in the second jaw portion 1''. Said indentation is positioned on the end of the jaw portion 1'' which extends from the point of rotation A towards the side edge of the first jaw portion 1'. Thus, the jaw portions 1', 1'' are prevented from rotating back and becoming disengaged from the apertures 13.

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An alternative embodiment of the closure members 15,16 is shown in figure 14 and in more detail in figure 15. The projection/tongue 15 of the closure member is here positioned on the side wall of the jaw portion 1' and projects inwards in order to interact with an indentation/aperture 16 on the second jaw portion 1''. Said indentation/aperture 16 is placed in the same area as mentioned above in connection with the embodiment

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in figure 12.

As shown in the enlarged detailed drawings in figures 15a, b and c, the part of the jaw portion 1'' near the indentation/aperture 16 is furnished with a pocket 17 with an upwardly facing opening designed for the insertion of, for example, a screw driver 18. By turning the screw driver, the side wall of the jaw portion 1'' is pressed so that the indentation/aperture 16 disengages from the tongue 15 of the projection/tongue 15 of the first jaw portion 1', whereby the jaw portions 1', 1'' can rotate freely relative to one another, thereby causing the attaching members 6,7 of the clamp to disengage from the edges of the apertures 13 when dismounting the clamp.

In the alternative embodiment of the clamp according to figures 10, 11, 12, 13, 14 and 15, the locking member 2 in the jaw portion 1'' is made of two parallel arcuate rows of teeth 2a' spaced relative to one another, each affixed to one of the facing side walls of the jaw portion 1'' for engagement with the engaging end 3b of the ratchet arm 3.

Rotation of the jaw portions 1', 1'' towards one another is achieved in that the engaging end 3b of the ratchet arm 3 projects in through the slot 2b formed by the rows of teeth 2a' for resilient engagement by means of the engaging members 3d provided on the engaging end with the back of the toothed rows 2a, ie, the sides which face away from the clamp opening 1a. The retention of the attaching members 6,7 in the cableway/cable riser 14 is thereby achieved at the same time as conduit R is held in the clamp as shown in figures 12c and d, in particular. In this case the clamping members 15,16 may therefore be omitted.

The teeth in said rows of teeth 2a' can be provided in that the side walls of the jaw portion 1'' are made of plates having a number of projections that are bent inwards at an angle to the

plate whereby said two rows of teeth 2a' are produced having an intermediate slot 2b.

5 The resilient engagement of the ratchet arm 3 with the rows of teeth 2a' can be achieved, for example, in that the ratchet arm 3 is made of a resilient material which brings the engaging members 3d of the engaging end 3b into pressured abutment against said back of the rows of teeth 2a. Optionally, the engaging member itself 3d can be made of a resilient material  
10 in order to achieve the above described effect.

The jaw 1, the jaw halves 1', 1'', respectively, have at their side edges on each side of the mouth of the clamp opening 1a a hole 9 for interaction with the aforementioned hook-shaped  
15 attaching members 6,7 on a corresponding clamp, for mounting clamps one on top of another, as shown in figure 16. Mounting the clamp in the hole 9 of the underlying clamp happens in the same way as described hereinabove in connection with both clamps having a non-divided jaw 1 and clamps wherein the jaw  
20 1 comprises two jaw portions 1',1'', rotatable relative to one another.

As also shown in the drawing, and particularly clearly in figure 16, the point of rotation A of the jaw portions 1', 1''  
25 is laterally displaced from the bisecting plane B of the clamp opening 1a, see figure 11, and inwards above one of the jaw portions 1',1''. Said point of rotation A is preferably displaced inwards above jaw component 1' with ratchet arm 3.

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## P a t e n t   c l a i m s

1.

5 A fixing device for securing elongate articles such as conduits to a support structure, especially to cableways/cable risers, consisting of a clamp comprising a clamp opening (1a) provided with a U-shaped jaw (1) having attaching members (6,7) for interaction with complementary attaching members in the support  
10 structure, a closure means comprising a closure arm pivotally mounted at the mouth of the clamp opening (1a) for the retention of conduits placed in the clamp opening (1a), characterized in that the closure arm is formed by a ratchet arm (3) pivotally mounted by one of its ends (3a) at one side  
15 of the clamp opening (1a) near the mouth thereof, and the second free end of which forms an engaging end (3b), and is designed for snap engagement with a locking member (2) of complementary configuration at the opposite side of the clamp opening (1a) for pressing the conduit into the clamp opening  
20 (1a) and retaining it therein, and that the attaching members (6,7) are provided on the side of the jaw (1) opposite the mouth of the clamp opening (1a) and comprise projecting hooks (6,7) with hook openings (6a,7a), facing either towards or away from each other, for engagement with said complementary  
25 attaching members in the support structure, eg, edges of the apertures (13) in the cableway/cable riser (14).

2.

30 A fixing device according to claim 1, characterized in that the locking member (2) is arranged so as to be resiliently tensioned in the direction of the clamp opening (1a) for resilient abutment against the engaging end (3b) of the ratchet arm (3) in the pivoted, active position thereof.

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3.

A fixing device according to claim 1, characterized in that the engaging end (3b) of the ratchet arm (3) is positioned for resilient abutment against the locking member (2).

5

4.

A fixing device according to claim 2 and/or claim 3, characterized in that the locking member (2) and/or the engaging end (3b) are made with one or more projections/teeth (2a,3c) for engagement with one another in a desired position which is dependent upon the outer dimension of the conduit.

10

5.

A fixing device according to claim 2, characterized in that the locking member (2) is resiliently connected to the jaw (1) at one side of the clamp opening (1a) for resilient pivoting of the locking member (2) in towards the clamp opening (1a).

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20

6.

A fixing device according to claim 2, characterized in that the locking member (2) has two parallel elongate guiding traces (2b) spaced apart for interaction with two guiding pins (8) secured to the jaw (1), said guiding pins (8) and guiding traces (2b) being positioned and oriented in such a way that by means of a locking spring (4) in the form of a bent laminate spring which is fastened to one side wall (1c) of the jaw (1), the locking member (2) can be moved/forced in the direction of the engaging end (3b) of the ratchet arm (3) when pivoted into its closure position (see figures 4, 5 and 6).

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7.

A fixing device according to claim 1, characterized in that one hook (6) is arranged so as to be resiliently movable for both

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mounting and dismounting the clamp from said attaching members in the support structure.

8.

5 A fixing device according to claim 7, characterized by a lock (10) for the hook (6) comprising an eccentric body (11) having a operating arm (12) mounted on the jaw (1) and in abutment against the stem (5) of the hook (6) which is resilient and secured to the jaw (1), in order to force the hook (6), by  
10 turning the eccentric body (11), in the outwards direction to engagement with said attaching member in the support structure (14), or optionally holes (9) in the jaw (1).

15 9.

A fixing device according to any one of the preceding claims 1 to 6, characterized in that the two oppositely positioned sides of the clamp opening (1a) are made by two jaw portions (1',1'') rotatable relative to one another with the point of  
20 rotation (A) at the lower edge of the clamp opening (1a), so that by relative rotation of the jaw portions (1',1''), the distance between the attaching members (6,7) is altered for insertion into complementary attaching members (13) in the support structure, eg, apertures (13) in a cableway/cable riser  
25 (14), and thereafter by rotating the jaw portions (1',1'') back to the operative position to bring the attaching members (6,7) into engagement with the edges of the apertures (13), and clamping members for retaining said operative position.

30 10.

A fixing device according to claim 9, characterized in that the clamping members comprise the ratchet arm (3) and the locking member (2) of the jaw (1).

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11.

A fixing device according to claim 9, characterized in that the clamping members are formed by the complementary closure members (15,16) arranged on each jaw portion (1',1'').

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12.

A fixing device according to claim 11, characterized in that the complementary closure members (15,16) are formed by a projection/tongue (15) on the first jaw portion (1') and an indentation/aperture (16) on the second jaw portion (1''), or vice versa.

10

13.

A fixing device according to any one of the preceding claims 1, 3, 4, 7, 8, 9, 10, 11 and/or 12, characterized in that the locking member (2) is formed by two parallel, arcuate rows of teeth (2a') spaced apart, each one affixed to one of the two oppositely positioned side walls of the jaw (1)/jaw portion (1'') for engagement with the engaging end (3b) of the ratchet arm (3).

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20

14.

A fixing device according to claim 13, characterized in that the engaging end (3b) of the ratchet arm (3) projects in through the slot (2b) formed between the rows of teeth (2a') for resilient engagement by means of the engaging bodies (3d) positioned on the engaging end with the back of said rows of teeth (2a'), ie, the sides that face away from the clamp opening (1a).

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15.

A fixing device according to claim 7, characterized in that the jaw (1) has, at each of its side edges on each side of the

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mouth of the clamp opening (1a), a hole (9) for interaction with said hooks (6,7) on a corresponding clamp for mounting clamps one on top of another.

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16.

A fixing device according to claim 9, characterized in that the point of rotation (A) is laterally displaced from the bisectonal plane (B) of the clamp opening (1a) and inwards  
10 above one of the jaw portions (1',1''), preferably the jaw portion (1') having the ratchet arm (3).

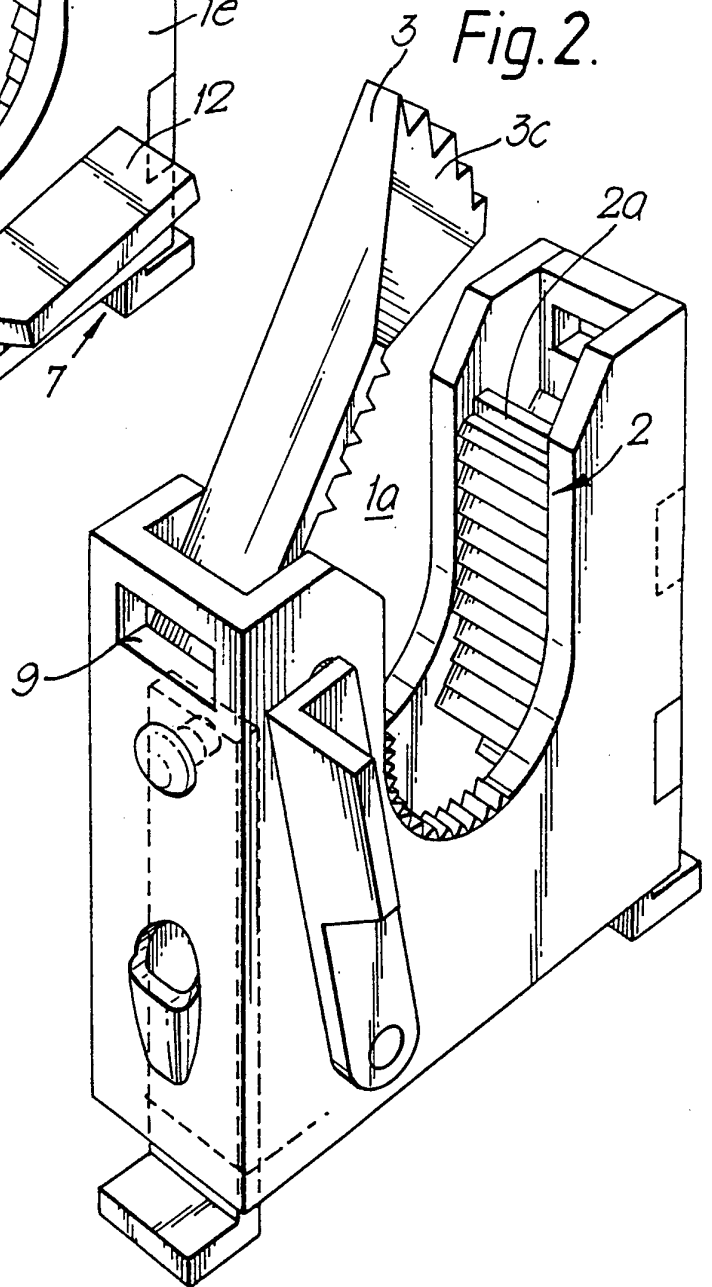
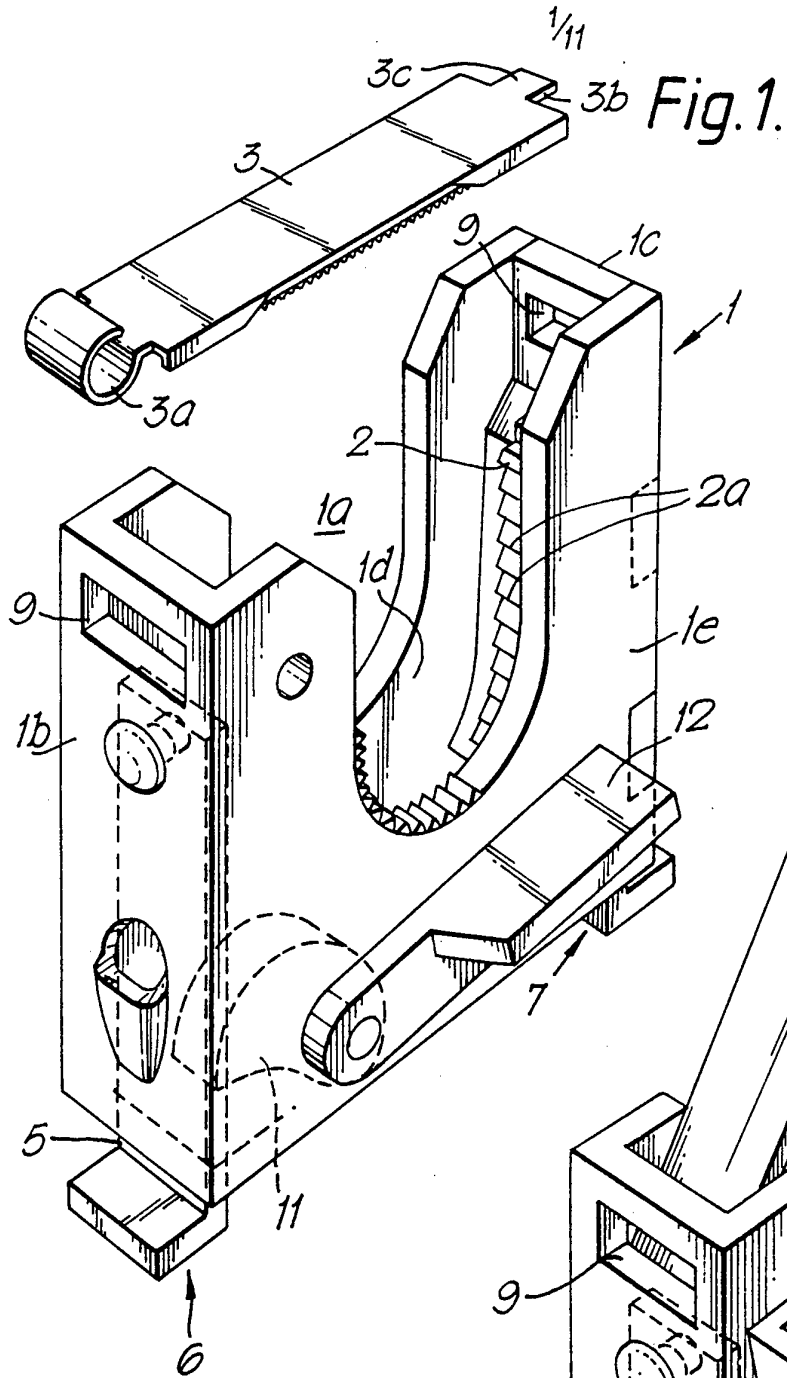
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Fig. 3a.

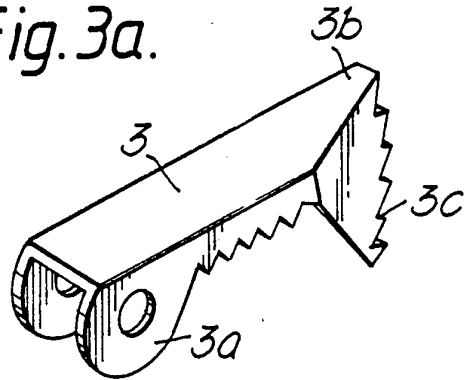


Fig. 3b.

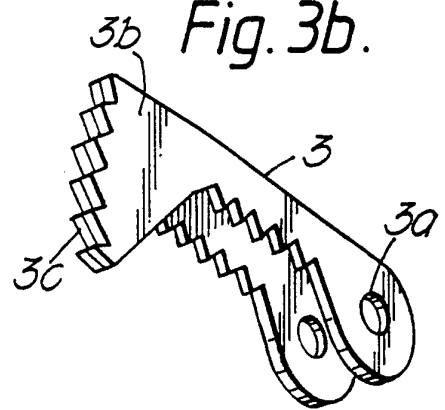


Fig. 4a.

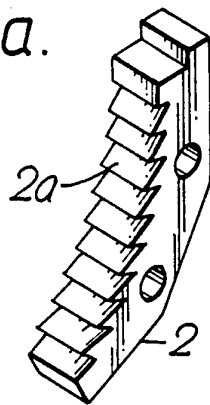


Fig. 4b.

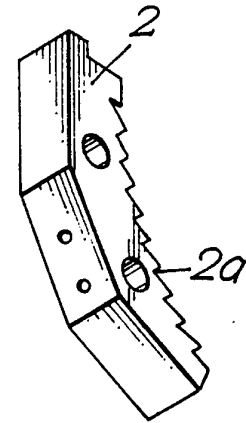
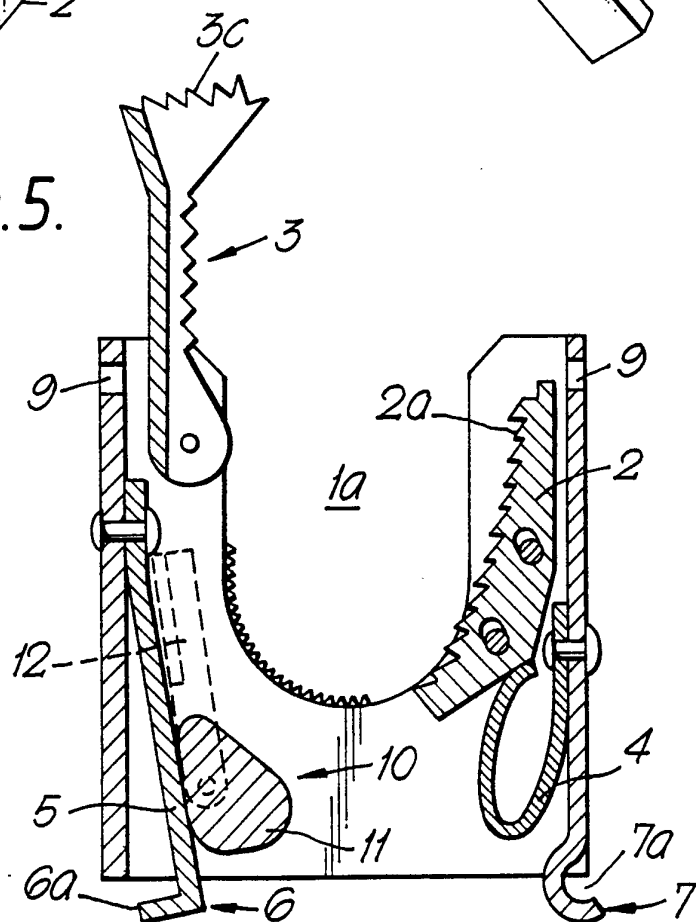
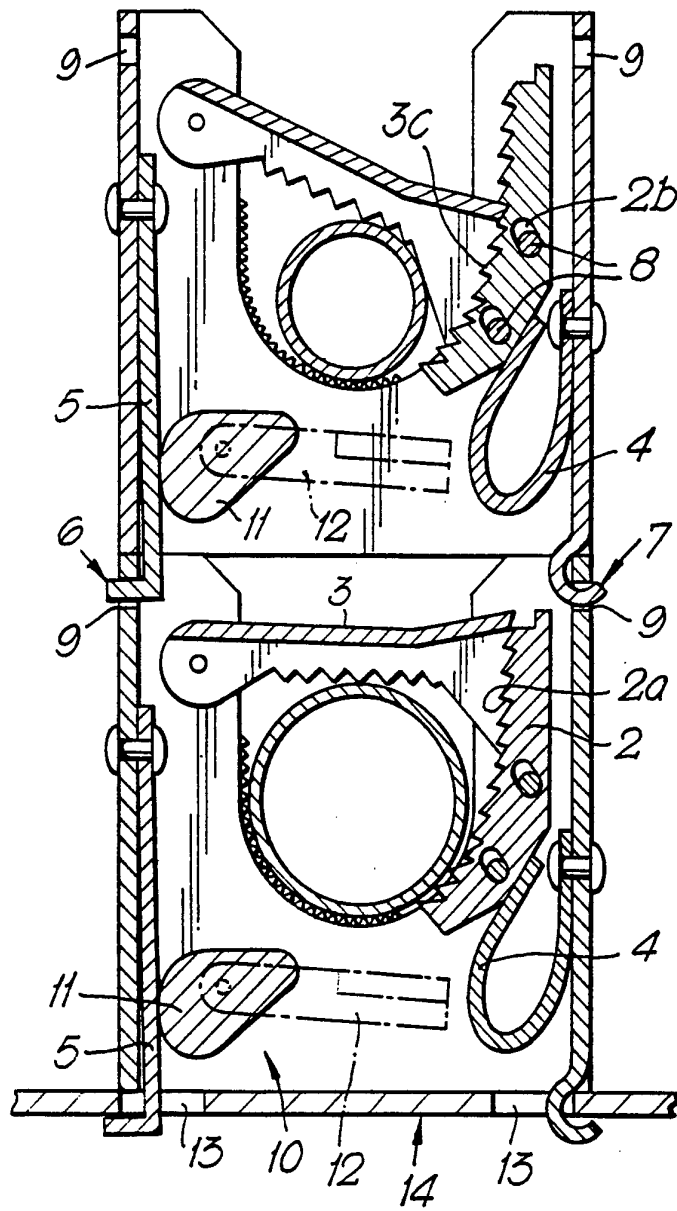


Fig. 5.



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Fig. 6.



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Fig.7a.

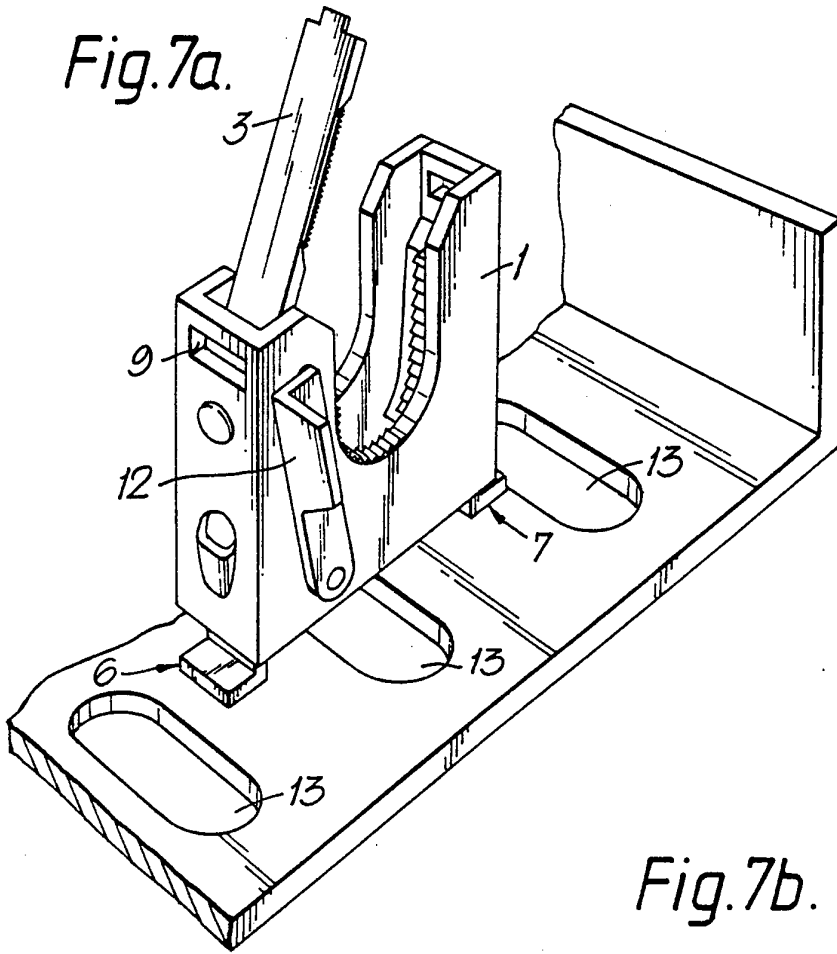
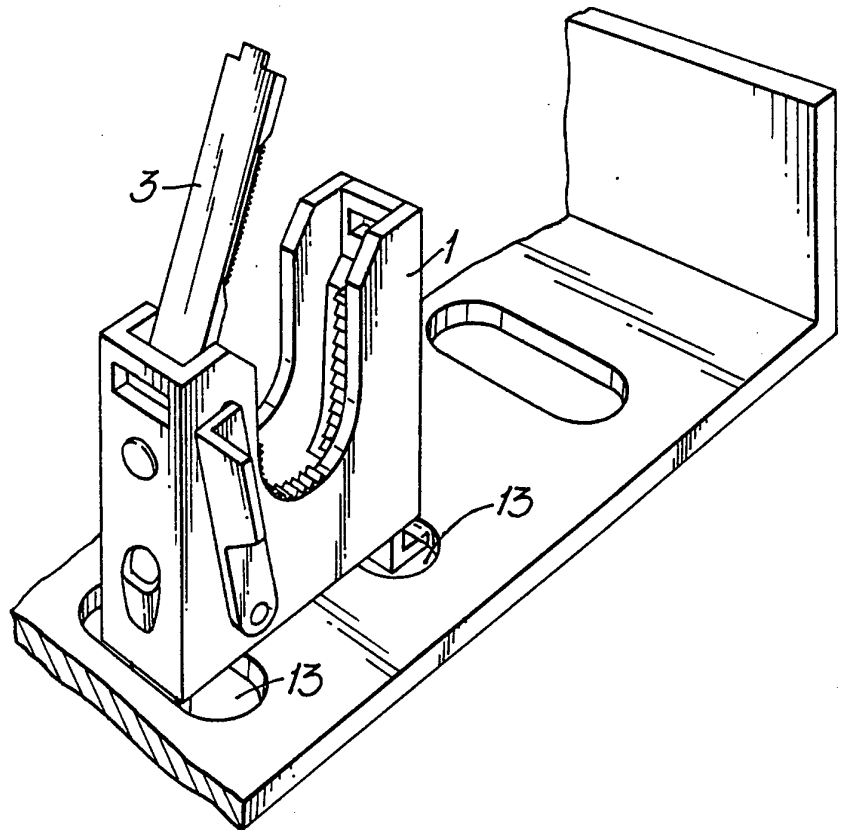


Fig.7b.



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Fig.7c.

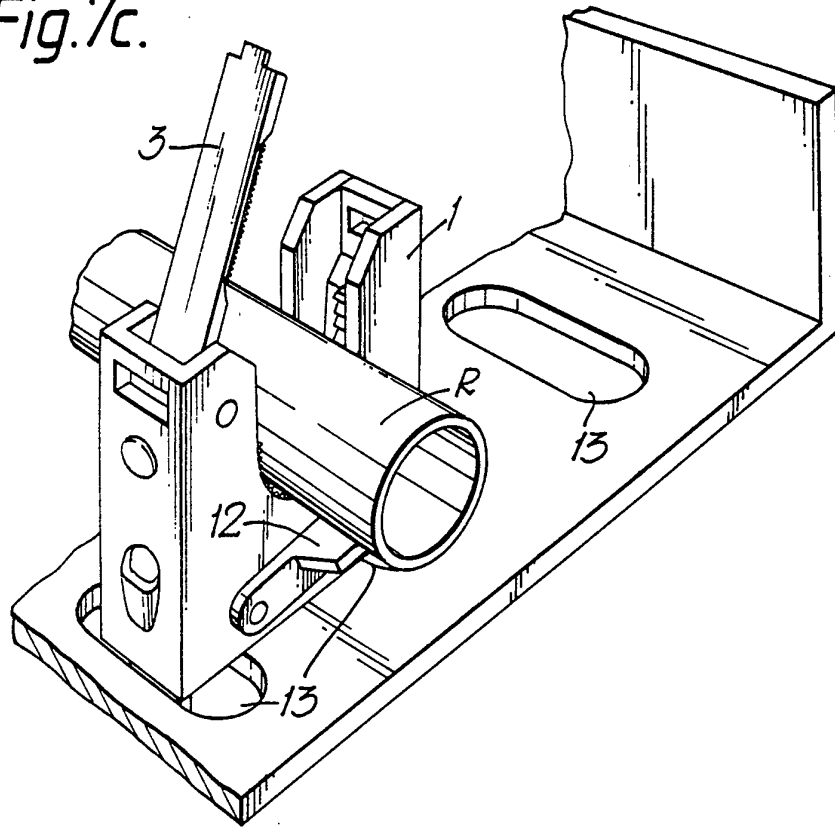
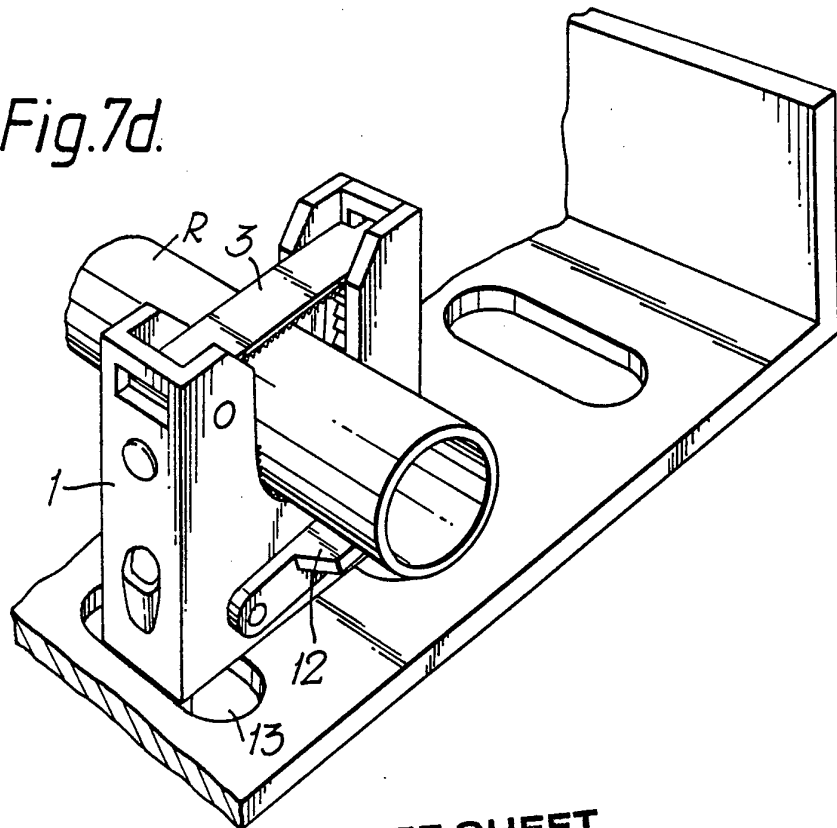
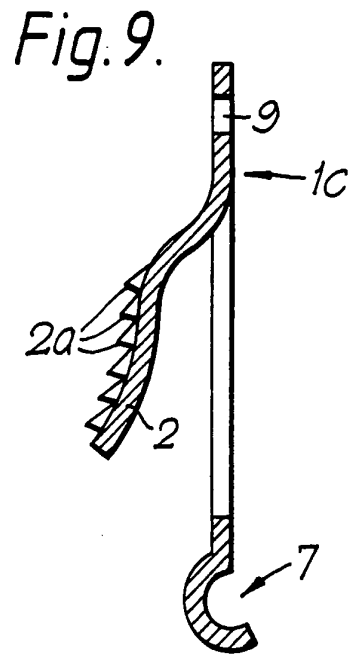
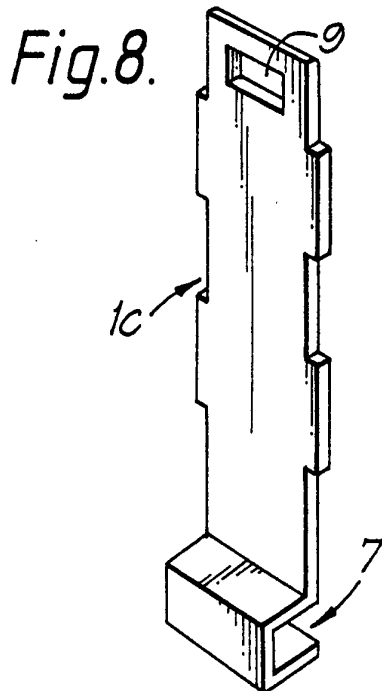
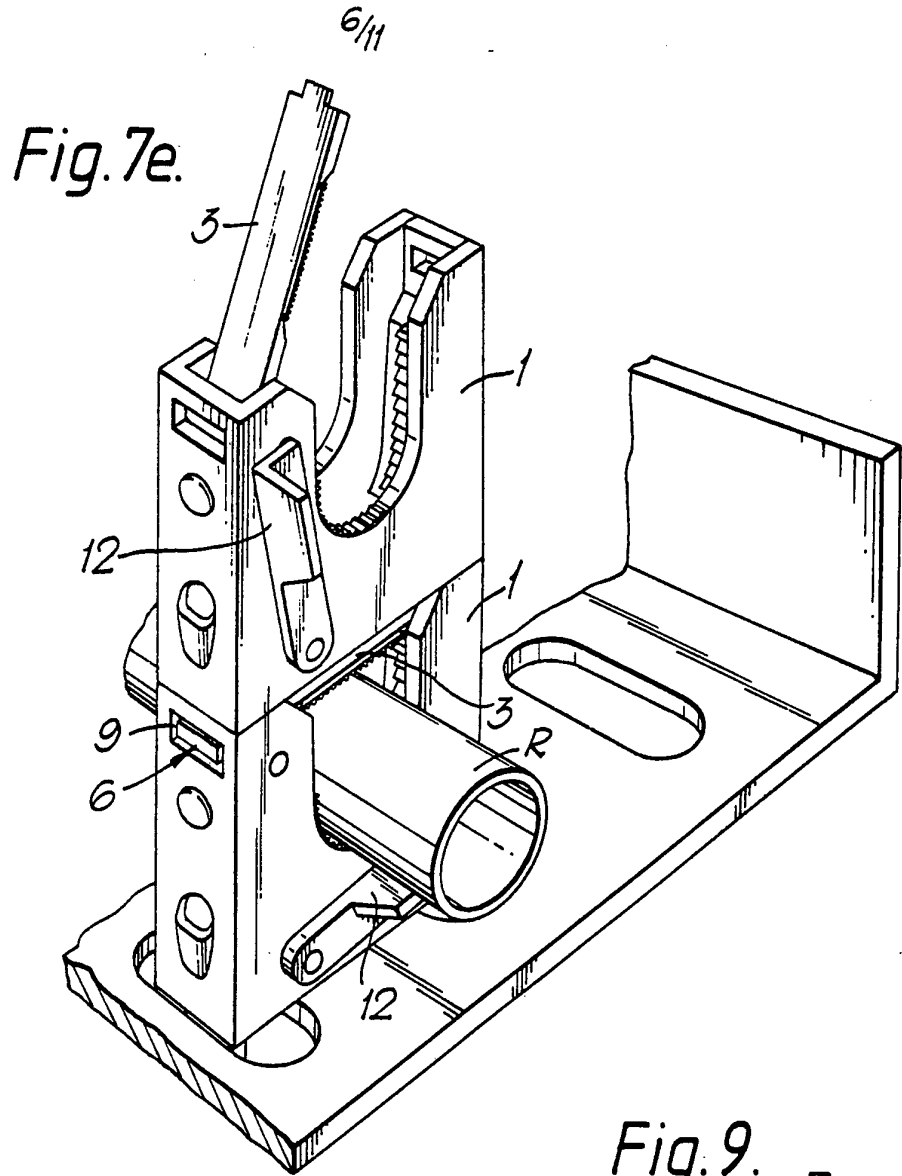


Fig.7d.



**SUBSTITUTE SHEET**



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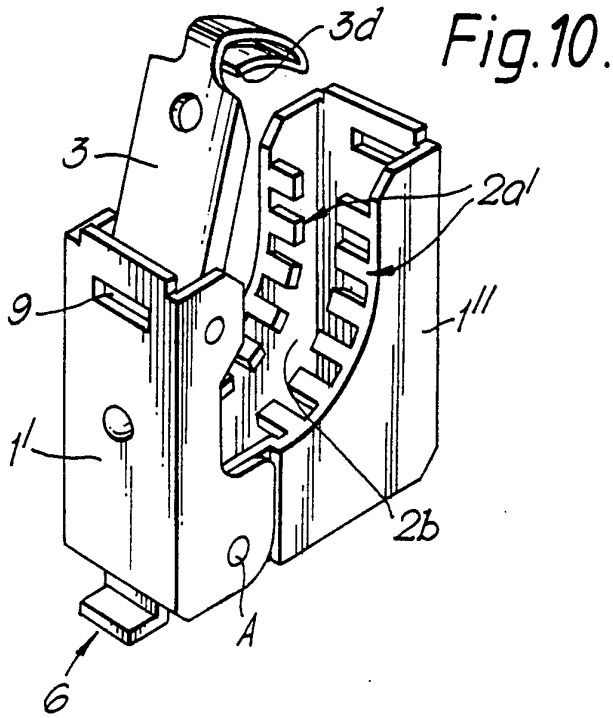


Fig.11.

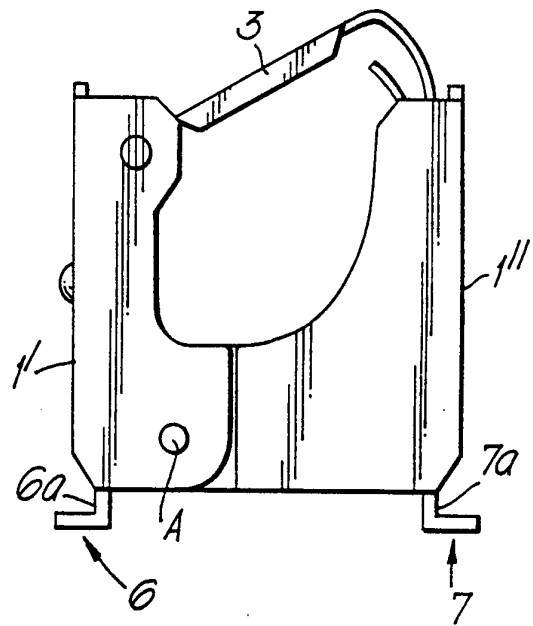
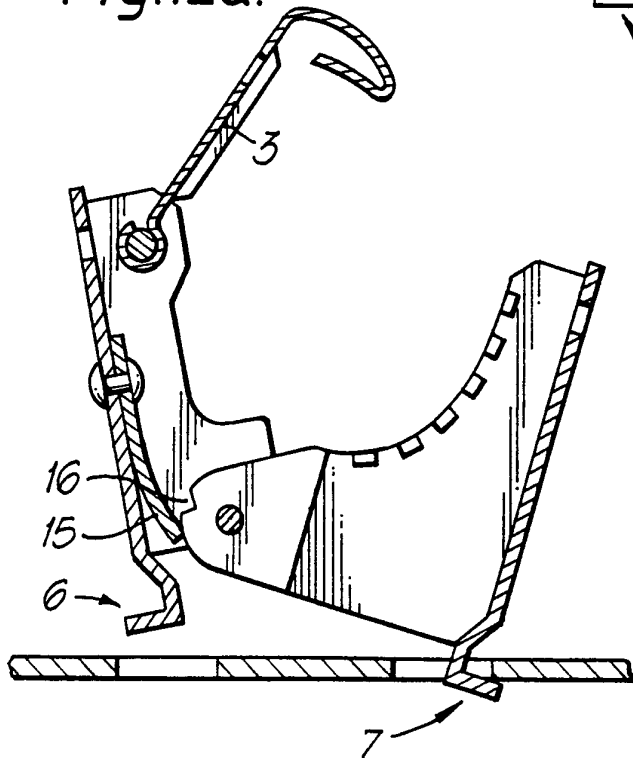


Fig.12a.



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Fig. 12b.

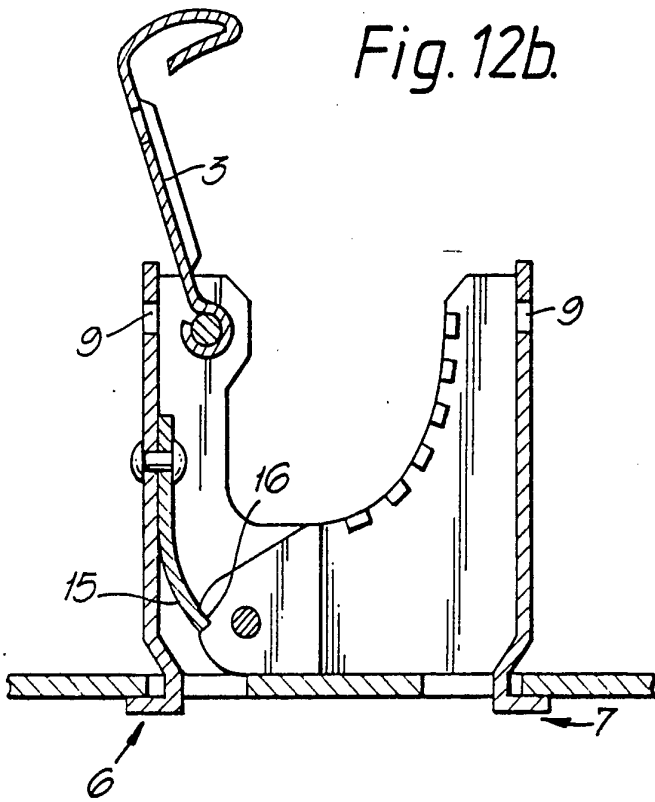


Fig. 12c.

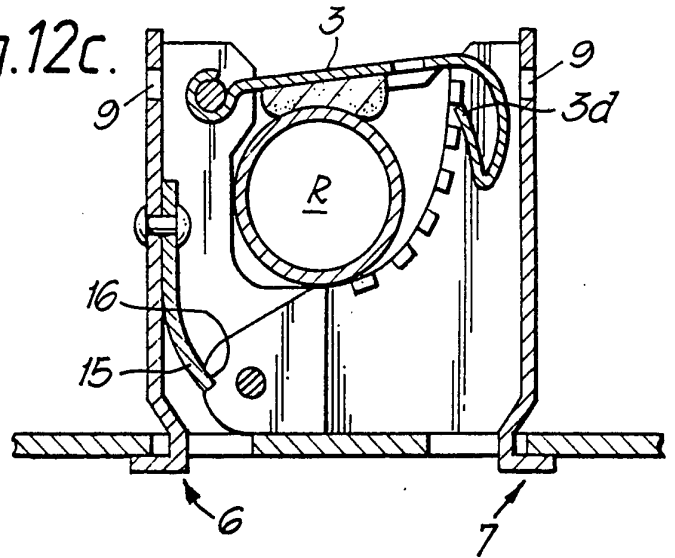
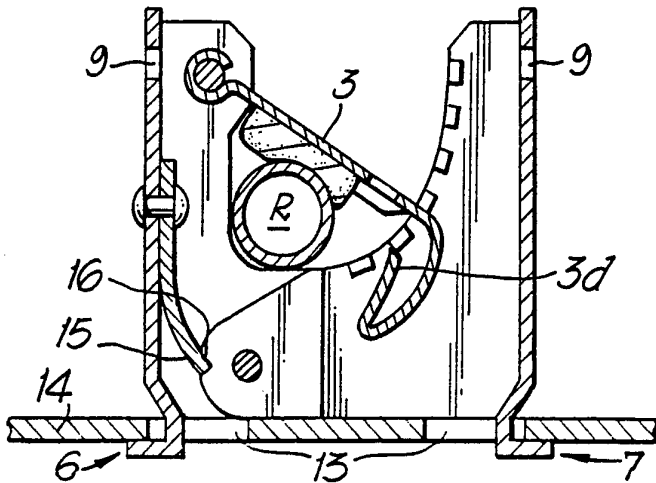
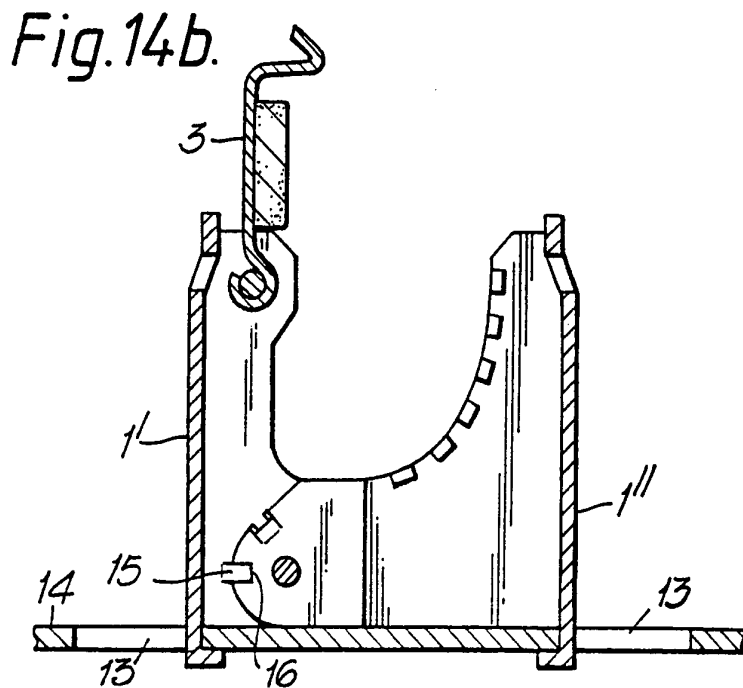
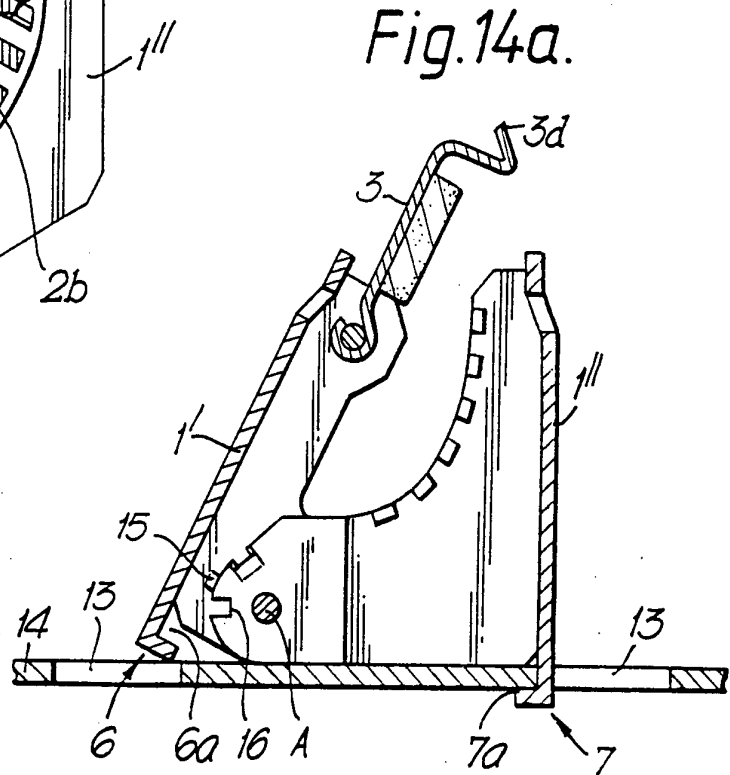
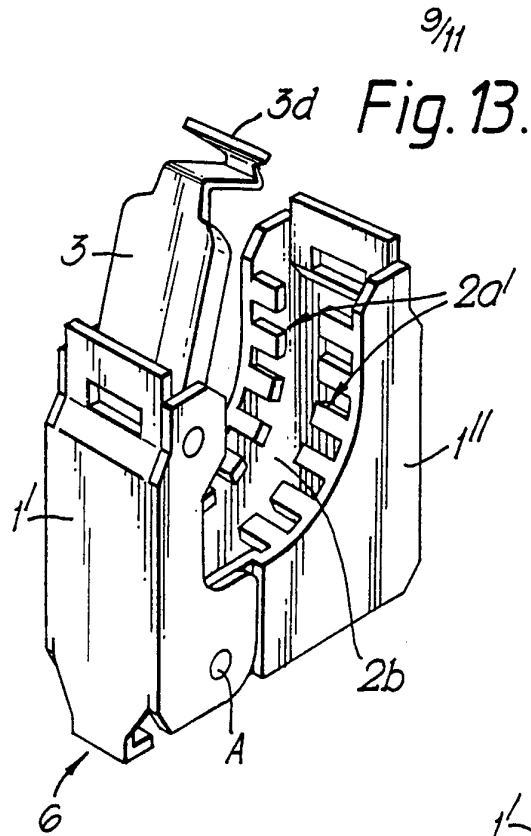


Fig. 12d.





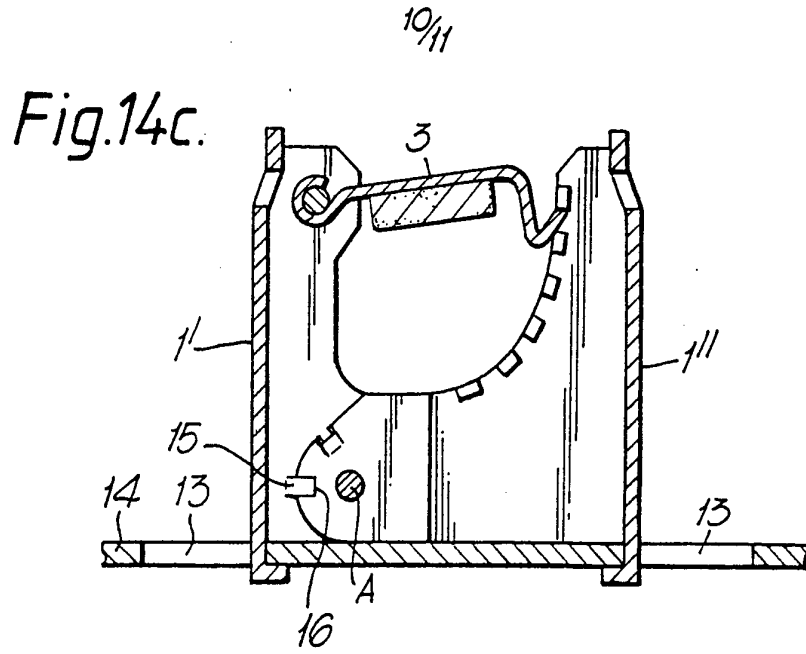


Fig.15a.

Fig.15b.

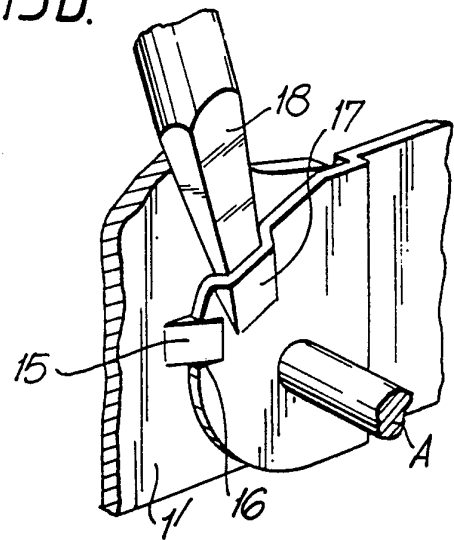
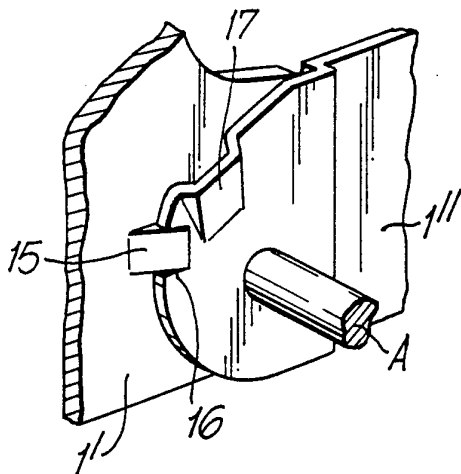
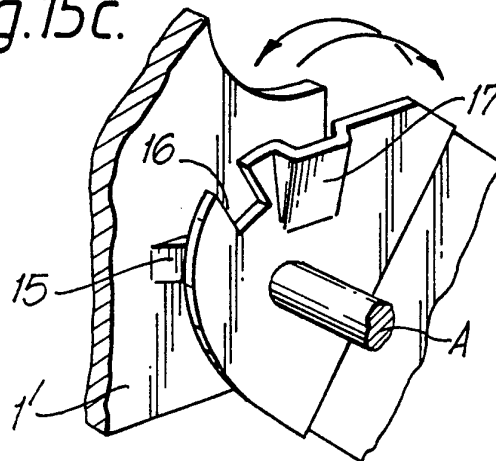


Fig.15c.





## INTERNATIONAL SEARCH REPORT

International application No.

PCT/NO 93/00130

A. CLASSIFICATION OF SUBJECT MATTER		
<b>IPC5: F16L 3/10</b> According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols)		
<b>IPC5: F16L</b>		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
<b>SE,DK,FI,NO classes as above</b>		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE, A1, 3511265 (MANNESMANN AG), 9 October 1986 (09.10.86), figures 1-3 --	1-4,7
A	SE, B, 450037 (BERT ERICSON), 1 June 1987 (01.06.87), figures 2a,2b --	1,7
A	EP, A3, 0125821 (PLESSEY OVERSEAS LIMITED), 21 November 1984 (21.11.84), figures 1,2 --	1,7
A	DE, A1, 2633442 (UNITED-CARR LTD), 26 January 1978 (26.01.78), figures 1-6 --	1
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search		Date of mailing of the international search report
23 November 1993		01 -12- 1993
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86		Authorized officer Axel Lindhult Telephone No. +46 8 782 25 00

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/NO 93/00130

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	GB, A, 2117483 (THOMAS WILLIAM GERDING), 12 October 1983 (12.10.83), figures 1-8  -- -----	1

**INTERNATIONAL SEARCH REPORT**  
 Information on patent family members

01/10/93

International application No.  
 PCT/NO 93/00130

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE-A1- 3511265	09/10/86	NONE	
SE-B- 450037	01/06/87	DE-A- 3608071 SE-A- 8404865	17/09/87 29/03/86
EP-A3- 0125821	21/11/84	GB-A,B- 2139280 JP-A- 59208208	07/11/84 26/11/84
DE-A1- 2633442	26/01/78	NONE	
GB-A- 2117483	12/10/83	CA-A- 1186669 US-A- 4436266	07/05/85 13/03/84