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(54) **Fastening arrangement, in particular for sports footwear**

(57) The present invention refers to a fastening arrangement, in particular for sports footwear, comprising a base (2), to which there is movably connected a lever arm (6) for tensioning a strap (20) provided with cogs (19); the arrangement further comprises release means (12, 17, 18) for gradually releasing, i.e. loosening said strap (20) on a cog-by-cog basis by one or several of

said cogs (19), as well as release means (13) for completely releasing said strap (20). The gradual release means (12, 17, 18) and the complete release means (13) are provided distinct from each other and capable of being actuated separately by means of first actuation means (14) and second actuation means (21), respectively.

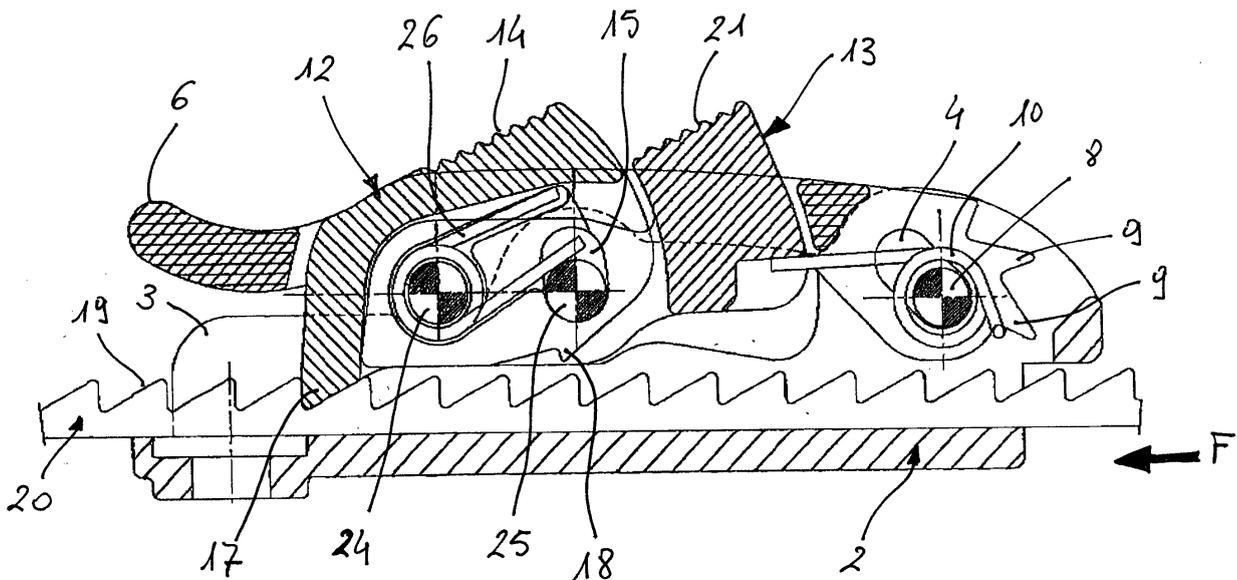


Fig. 3

## Description

**[0001]** The present invention refers to a fastening arrangement, in particular for sports footwear, such as for instance ski or snowboard boots, skating boots, mountaineering boots or shoes, cycling shoes, and the like.

**[0002]** The Italian utility model document No. 243463, filed on March 17<sup>th</sup> 1997 in the name of Officine Everest SpA, discloses a fastening arrangement of the lever and cog strap type for sports footwear in general, which comprises a draw or tensioning lever and ratchet-type engaging means for a cog strap. These ratchet-type engaging means comprise a pair of pawls having a different length, which are arranged side by side with each other and are capable of being alternatively engaged by the cog strap, so as to allow for a controlled reduction in the degree of fastening by realising said strap on a cog-by-cog basis.

**[0003]** A drawback that is encountered with such prior-art solution derives from the fact that the alternative operation of the two pawls is the cause of uncertainty when actuating the fastening device, since a user is not in a position as to know which one of the two pawls is engaging the strap, so that he/she does not know exactly which pawl has to be actuated, actually. On the other hand, if the user decides to actuate both pawls at the same time, all he/she obtains is to cause the strap to be fully released, and this may possibly be just an undesired effect.

**[0004]** A further major drawback of the above-cited solution lies in the fact that, owing to only one of the two juxtaposed pawls engaging the strap at a time, the load imposed on such strap due to the fastening, i.e. stretching force acts in an out-of-axis, staggered manner on the same strap relative to the longitudinal axis of the fastening device, thereby possibly causing the same strap to get stuck onto or against the support base or, anyway, giving rise to possible malfunctioning owing to a non-axial tension.

**[0005]** Still a further drawback of the prior-art device derives from the size of the strap: in fact, since the cog relating to the pawl that temporarily engages the strap by penetrating it up to half the cross-section thereof must be able to withstand the tensile forces and stresses normally occurring in such kind of devices, and must therefore be adequately sized to such purpose, the strap used in the fastening device disclosed in the above-cited patent publication must be given a double width as compared with a normal strap that is totally penetrated by the pawl, i.e. in which the pawl fits through the entire cross-section thereof.

**[0006]** It therefore is an object of the present invention to do away with the drawbacks of prior-art solutions as indicated above by providing a fastening arrangement that allows for both a gradual release, on a cog-by-cog basis, and a total release of a strap, while at the same time being most convenient and immediate to perform through unequivocal and distinct actions for the two func-

tions of gradually and totally releasing the strap.

**[0007]** Within the above general object, another important purpose of the present invention is to provide a fastening arrangement of the above-indicated kind, in which the strap is subject to an axial tension both when it is released gradually and when it is in a condition in which the footwear is tightly fastened.

**[0008]** A further purpose of the present invention is to provide a fastening arrangement of the above-indicated kind, in which the strap has a reduced size and, anyway, a size that is not greater than that of the usual straps that are to be found currently on the marketplace.

**[0009]** Finally, an equally important purpose of the present invention is to provide a fastening device that is capable of being easily manufactured at reasonably low costs with the use of readily available, largely known tools, materials and component parts.

**[0010]** According to the present invention, these aims, along with further ones that will be apparent in the following description, are reached in a fastening arrangement, in particular for use in conjunction with sports footwear, which is as defined and recited in the appended claim 1.

**[0011]** Defined in the following sub-claims are further features and advantages of the present invention, which will anyway be more readily understood from the description of a particular, although not sole embodiment thereof that is given below by way of non-limiting example with reference to the accompanying drawings, in which:

- Figure 1 is a perspective top view of a fastening arrangement according to the present invention;
- Figure 2 is a perspective exploded view of the arrangement shown in Figure 1;
- Figure 3 is a cross-sectional view of the arrangement shown in Figure 1, in the fastened or resting state thereof;
- Figure 4 is a cross-sectional view of the arrangement in the state in which the strap is being tensioned;
- Figure 5 is a similar view as the preceding one of the arrangement as the strap is being released gradually;
- Figure 6 is a similar view as the preceding one of the arrangement as the strap is totally released.

**[0012]** With reference to the above-indicated Figures, the fastening device according to the present invention, as generally indicated at 1, comprises a base 2 firmly joined with one of the flaps (not shown) of the footwear; this base 2 is provided with side walls 3, each one of which is provided with a first pair of slot-like perforations 4 which, for reasons of greater simplicity and brevity, shall be simply referred to as slots 4 hereinafter, and a second

pair of holes 5. The slots 4 are arranged substantially inclined relative to the plane of the base 2, and to such slots 4 there is connected, by means of a first pin 8, a lever arm 6 that is in turn provided with a through-hole 7; this lever arm 6 will therefore be able to move relative to the base 2 with a combined oscillatory and translatory motion along the direction of the slots 4.

**[0013]** In the zone thereof lying adjacent to the through-hole 7, the lever arm 6 is provided with a plurality of crosswise extending cogs 9; also provided are first elastic means 10, such as one or more torsion springs arranged coaxially relative to the first pin 8, which are used to keep the lever arm in the resting position thereof, so as illustrated in Figure 3, with said first pin 8 accommodated in the slots 4 at the end portions thereof facing the bottom of the base 2.

**[0014]** The lever arm 6 is provided centrally with an aperture 11 to receive a pawl 12 and a related support link member 13 therein, as this shall be explained in greater detail further on.

**[0015]** The pawl 12 is provided with first actuating means, such as a push-button 14, guide means 15, such as a slot-like hole, a through-hole 16, a first crosswise extending cog 17 and a second crosswise extending cog 18, which are spaced from each other by a centre-to-centre distance equal to approx.  $(n + \frac{1}{2})$  times the pitch, i.e. the lineal distance between the cogs 19 of a strap 20 adapted to be inserted between the base 2 and the assembly formed of the lever arm 6 and the pawl 12.

**[0016]** The support link member 13 is provided with second actuating means, such as a push-button 21, a third pair of holes 22 and a fourth pair of holes 23.

**[0017]** Mounting the pawl 12 on its support link member 13, and the latter on the walls 3 of the base 2, takes place as follows: a second pin 24 extending through the fourth pair of holes 23 of the support link member 13 and the through-hole 16 of the pawl 12 pivotally connects the pawl 12 to its support link member 13, whereas a third pin 25 extending through the second pair of holes 5 of the base 2, the third pair of holes 22 of the support link member 13, and the guide means 15 of the pawl 12, is used to pivotally connect the support link member 13 and the pawl 12 to the base 2, while anyway allowing for the pawl 12 to pivotally rotate relative to the support link member 13 and the base 2 about the second pin 24 owing to the provision and the action of the guide means 15, which - as already noted above - may for instance consist of a slot-like hole. There are provided second elastic means 26, such as one or more torsion springs arranged coaxially relative to the second pin 24, and interacting with a third pin 25, which are used to keep the first cog 17 of the pawl 12 firmly engaged with the cogs, i.e. the serration 19 of the strap 20 when the arrangement 1 is in its closed or resting condition, as illustrated in Figure 3; in such condition, also the end portion of the support link member 13 provided with said fourth pair of holes 23 is elastically urged by the second elastic means 26 against the strap 20.

**[0018]** The way in which the arrangement according to the present invention works is as follows: with the lever arm 6 and the assembly formed of the pawl 12 and the related support link member 13 lying in the closed or resting condition thereof, as shown in Figure 3, the cog strap 20 is inserted manually - in the direction shown by the arrow A - in the aperture existing between the bottom of the base 2 and the cogs 9 of the lever arm 6, and is then pushed further on towards the first cog 17 of the pawl 12. At this point, the first cog 17 of the pawl 12, by overcoming the elastic reaction of the second elastic means 26, slides along the cogs, i.e. the serration 19 of the cog strap 20, thereby allowing the latter to move freely forwards in the direction shown by the arrow A relative to the arrangement 1, with said first cog 17 engaging the root or bottom land of a respective cog of the strap serration 19 each time it surmounts a preceding cog, thereby maintaining the position so reached each time.

**[0019]** In order to next cause the strap 20 to be forcedly brought into tension, the lever arm 6 is actuated and displaced in the direction indicated by the arrow B in Figure 4. In this way, this lever arm 6, by rotating about the first pin 8 and moving translatorily with the latter along the pair of slots 4, urges one of its cogs 9 to elastically engage - thanks to the action of the first elastic means 12 - one of the cogs of the serration 19 of the strap 20, under resulting translatory displacement of the same strap 20 in the direction indicated by the arrow A in Figure 4, wherein the way in which the pawl 12 works in this phase is the same as the way in which it works when the strap 20 is inserted manually, the first cog 17 sliding over the serration 19 against the elastic action of the second elastic means 26 and maintaining the position it reaches each time by temporarily engage one of the cogs of said serration 19 of the strap.

**[0020]** During its passive return stroke, i.e. as it travels backwards without producing any effect, the lever arm 6 slides along the pair of slots 4 so as to disengage from the serration 19 and position itself in correspondence of the root or bottom land of the next cog. Reiterating this oscillatory movement of the lever arm 6 causes the strap 20 to get tensioned up to the fastening degree as desired by the user.

**[0021]** For the fastening degree brought about by so tensioning the strap 20 to be gradually loosened, i.e. released, all it takes for the user to do is to act on the actuating push-button 14 of the pawl 12, as indicated by the arrow C in Figure 5; by doing so, the first cog 17 is disengaged, i.e. released from the root of the respective cog of the serration 19, thereby allowing the strap 20 to move translatorily in the loosening direction - as indicated by the arrow D - by a distance of approx. half a cog until another cog of the serration 19 is next engaged by the second cog 18 of the pawl 12; as the actuating push-button is then released again, said second cog 18 is caused to disengage said respective cog of the serration 19, thereby allowing the strap 20 to move on translatorily by a distance corresponding to the remaining half cog. Al-

together, the strap is caused to each time translate by a full cog and, hence, by a distance corresponding to the pitch, i.e. the spacing between the individual cogs of the serration 19, thanks to the particular centre-to-centre distance existing between the first and the second cog 17, 18 if the pawl 12, as already explained hereinbefore. By repeatedly performing this actuation and release operation of the push-button 14, a gradual loosening - on a cog-by-cog basis - of the strap 20 until the desired fastening tightness is reached.

**[0022]** If the user wishes to rapidly loosen, i.e. release the strap 20, all he/she has to do is simply acting on the actuating push-button 21 of the support link member 13, as indicated by the arrow E in Figure 6: by doing so, the support link member 13 - by rotating about the third pin 25 - causes both the first cog 17 and the second cog 18 of the pawl 12 to fully disengage from the serration 19 of the strap 20, thereby allowing the latter to be loosened in a rapid manner or even to fully slip off the arrangement 1.

**[0023]** As it can be readily appreciated from the above disclosure, the footwear fastening arrangement according to the present invention fully reaches the aims and advantages as set forth hereinbefore. As a matter of fact, what is provided is a fastening arrangement that allows for both a gradual release, on a cog-by-cog basis, and a total release of a strap in a most convenient and immediate manner through unequivocal and distinct actions to be performed for the two functions of gradually and totally releasing the strap. These two functions are in fact carried out by the pawl 12 and the support link member 13, respectively, in which said support link member 13 is provided distinct and separate from the pawl 12 in terms of actuation.

**[0024]** It should further be particularly noticed how the cog strap 20 is subject to a purely axial tension both when it is released or loosened gradually and when the footwear is in its fastened condition, owing to the first cog 17 or, as the case may be, the second cog 18 of the pawl 12 engaging the cogs of the serration 19 of the strap 20 along the entire cross-section thereof.

**[0025]** As a result, an advantage derives in that the width, i.e. cross-section, of the strap 20, although due to interact with an arrangement enabling the same strap to be released gradually, has not to be increased as compared to the usual one of prior-art straps, as this would on the contrary be the case with the solution disclosed in the afore-cited Italian utility model No. 243463.

**[0026]** It will anyhow be readily appreciated that the arrangement according to the present invention, so as described and illustrated above, may be subject to a number of modifications and be embodied in a number of different manners without departing from the scope of the present invention. Furthermore, the materials used for the various component parts of the inventive arrangement, as well as the shapes and the sizing thereof, may of course be each time so selected as to more appropriately fit the particular applications and requirements.

## Claims

1. Fastening arrangement, in particular for sports footwear, comprising a base (2), to which there is movably connected a lever arm (6) for tensioning a strap (20) provided with cogs (19), release means (12, 17, 18) for gradually releasing, i.e. loosening said strap (20) on a cog-by-cog basis by one or several of said cogs (19), as well as release means (13) for completely releasing said strap (20), **characterized in that** said gradual release means (12, 17, 18) and said complete release means (13) are provided distinct from each other and capable of being actuated separately by means of first actuation means (14) and second actuation means (21), respectively.
2. Fastening arrangement according to claim 1, wherein said gradual release means comprise pawl means (12) pivotally connected to said complete release means, including a support link member (13).
3. Fastening arrangement according to claim 2, wherein said pawl means (12) comprise a first cog (17) and a second cog (18), the latter being situated at a distance from said first cog (17) comprised between, but not including two contiguous multiples of the pitch, i.e. the lineal distance between said cogs (19), said first cog (17) and said second cog (18) being adapted to alternatively engage said cogs (19) when said first actuation means (14) are being operated and released.
4. Fastening arrangement according to claim 2, wherein said pawl means (12) are pivotally connected to said support link member (13) at a through-hole (16) provided in said pawl means (12) and a corresponding fourth pair of holes (23) provided in said support link member (13).
5. Fastening arrangement according to claim 4, wherein said support link member (13) is pivotally connected to said base (2) at a second pair of holes (5) provided in said base (2) and a corresponding third pair of holes (22) provided in said support link member (13).
6. Fastening arrangement according to claim 5, wherein said pawl means (12) are provided with guide means (15) that are axially aligned with said second and said third pair of holes (5, 22) to allow said pawl means (12) to oscillate relative to said support link member (13) and said base (2).
7. Fastening arrangement according to claim 6, wherein operating said second actuation means (21) causes said support link member (13) to oscillate relative to said base (2) jointly with said pawl means (12), said oscillation causing said first and said second

cog (18, 19) to fully disengage said cogs (19) and, hence, the strap (20) to be completely released.

8. Fastening arrangement according to any of the preceding claims, wherein the oscillation of said pawl means (12) occurs against the action of second elastic means (26). 5
9. Fastening arrangement according to any of the preceding claims, wherein the oscillation of said support link member (13) relative to said base (2) occurs against the action of first elastic means (10). 10
10. Fastening arrangement according to any of the preceding claims, wherein said lever arm (6) is provided centrally with an aperture (11) to accommodate said pawl means (12) and said support link member (13) therein. 15

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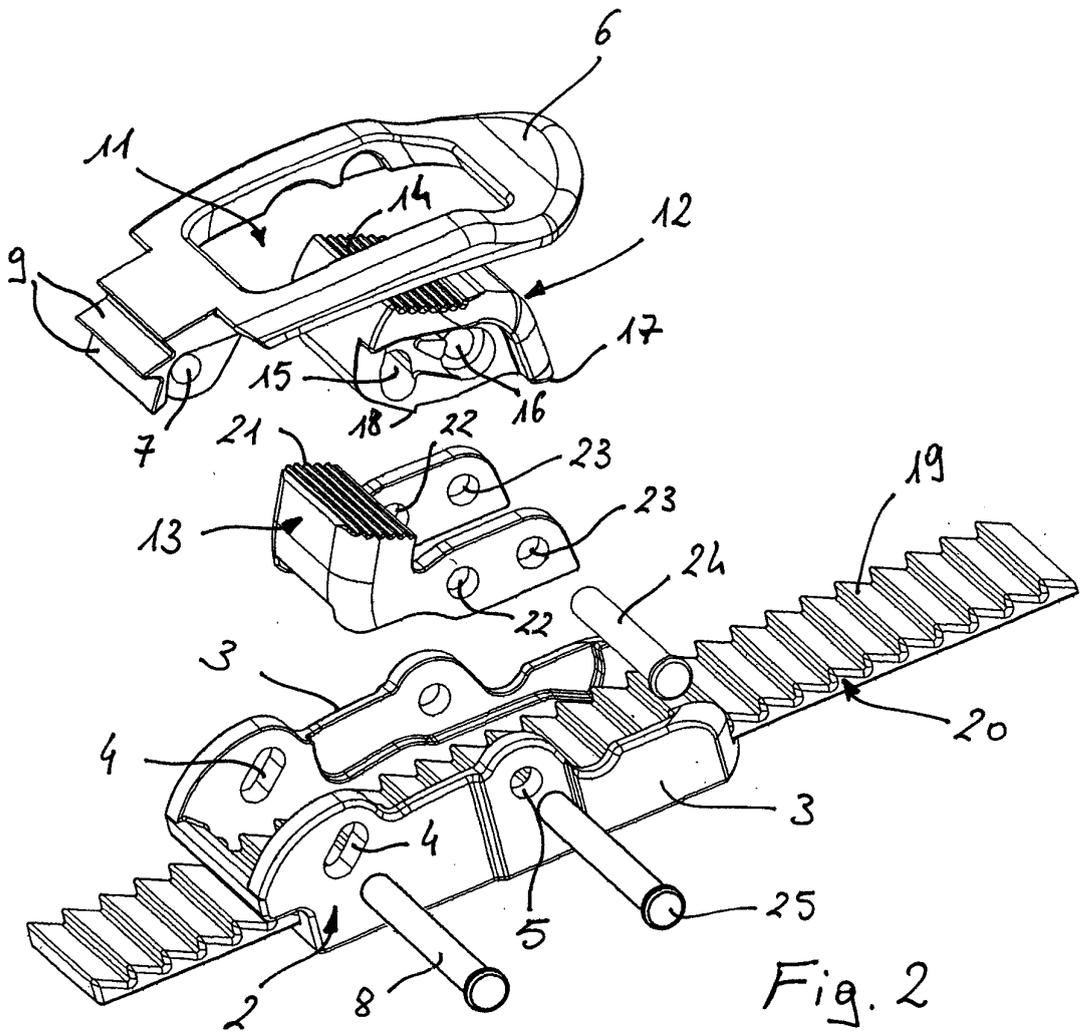
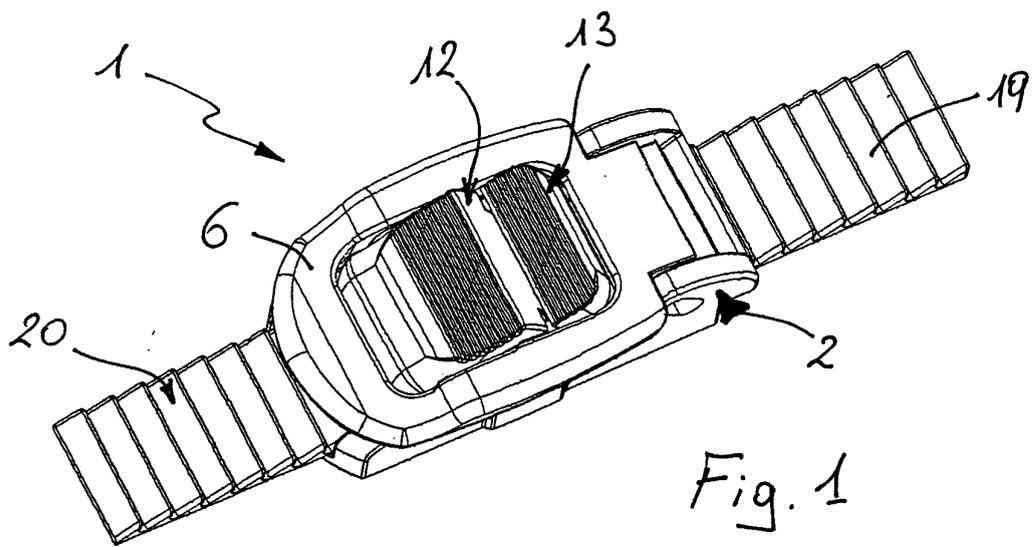
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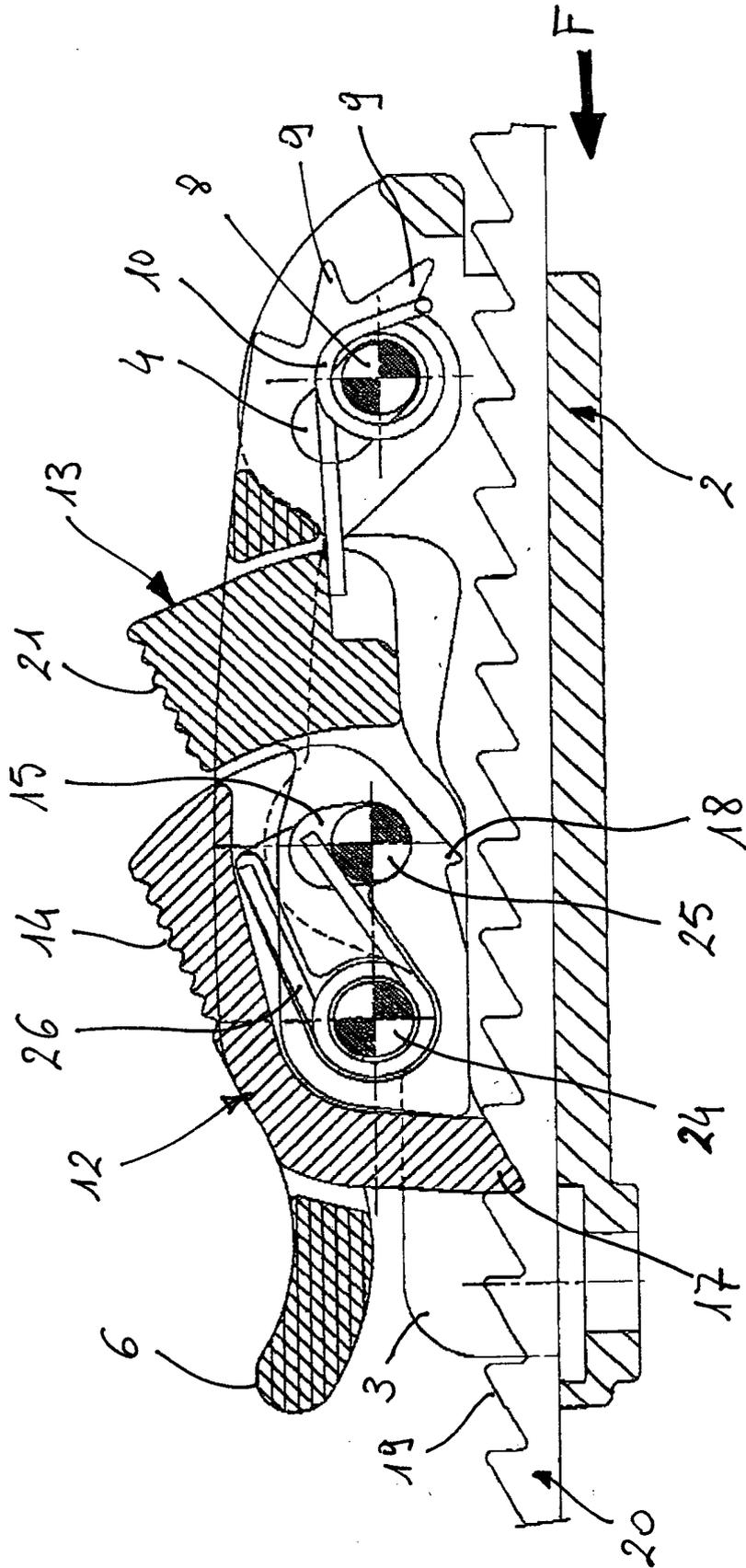
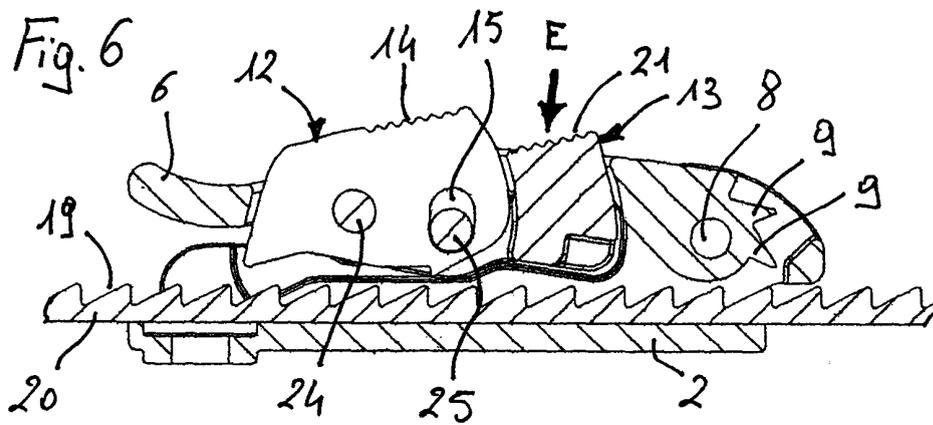
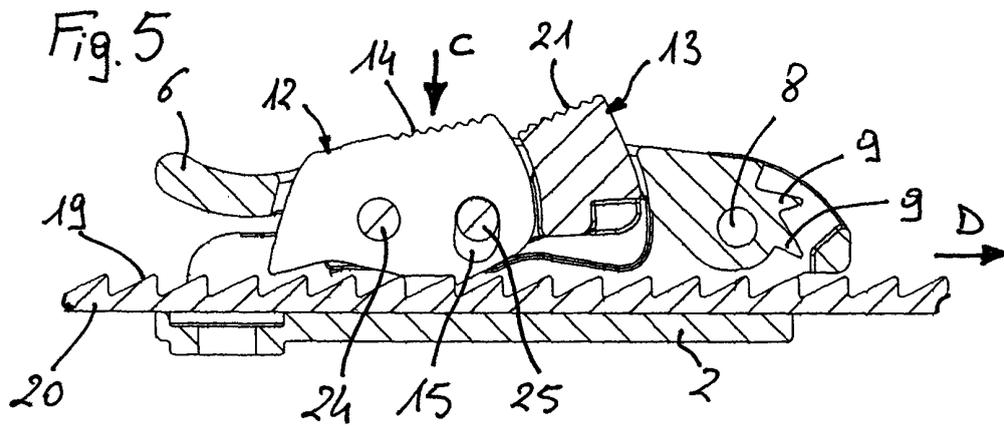
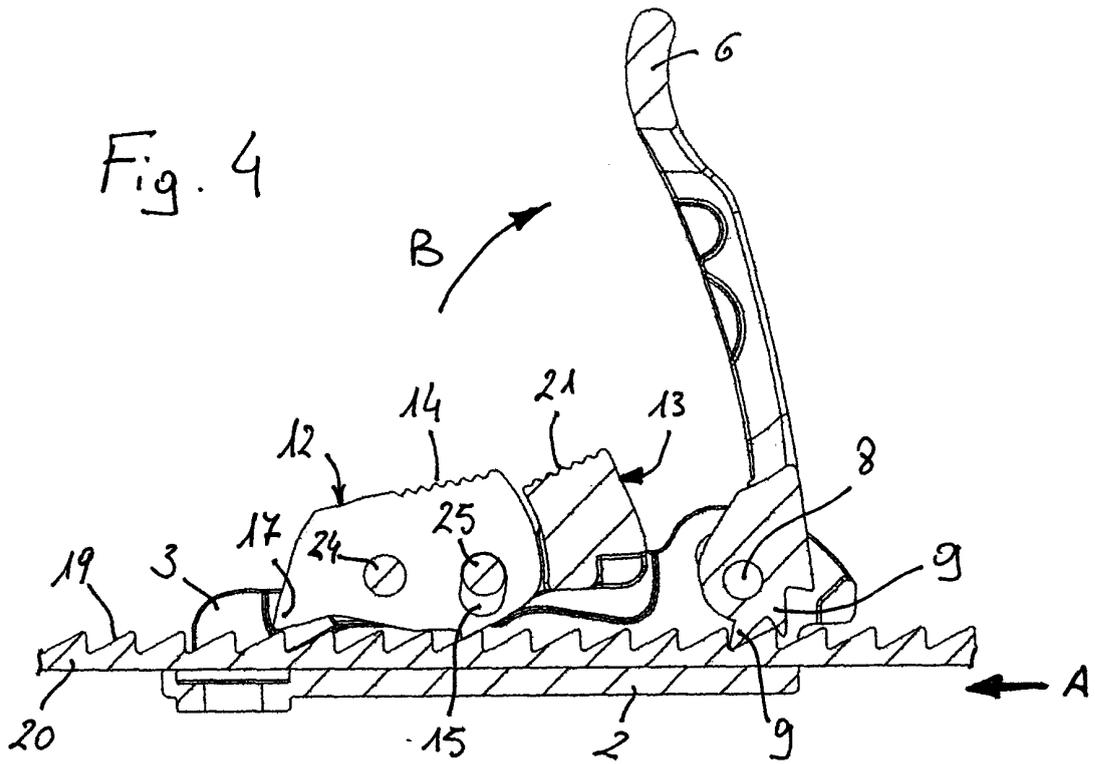


Fig. 3





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**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on  
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