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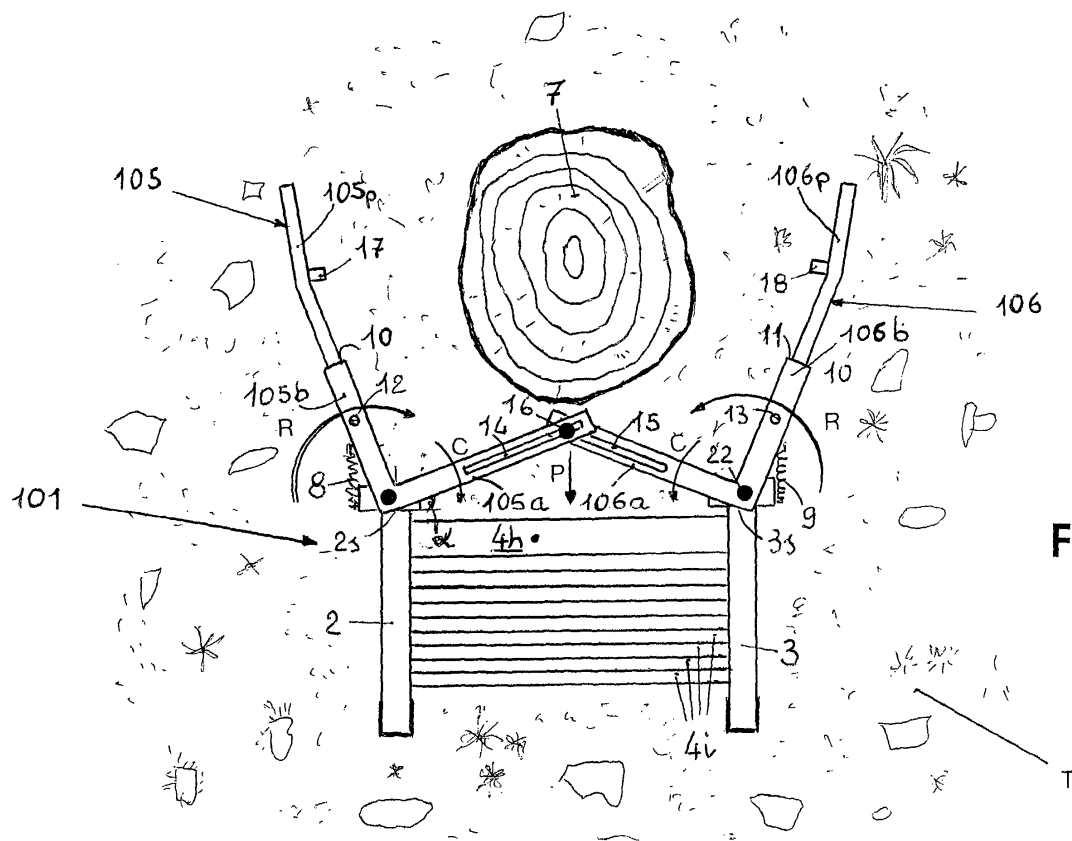
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Fiammenghi-Domenighetti, Delfina et al**Fiammenghi-Fiammenghi,****Via San Gottardo 15****6900 Lugano (CH)**(54) **Portable ladder with fixing elements**

(57) The invention describes a portable ladder (101) which is rested against a vertical object (7) and is composed of two longitudinal members (2,3) between which several steps (4i) are located and in which each of the upper ends (2s,3s) of the longitudinal members (2,3) which do not have to rest on the ground has, fixed to it, an element (105,106) with two sides (105a,105b,106a,

106b) which is shaped in the form of an "L" contained in a plane perpendicular to that of the longitudinal members (2,3). The two elements (105,106) fixed into a ladder (101) are the mirror image of each other and are able to rotate perpendicularly with respect to the longitudinal members (2,3) when one (105a,106a) of their two sides is pressed against the said vertical object (7).

**FIG. 3**

Description

[0001] The present invention relates to the technical sector dealing with the production industry for portable ladders, namely those ladders composed of one or more superimposed segments which are used to perform a wide variety of activities in the areas of maintenance, repair work, gardening, etc.

[0002] These ladders are essentially composed of two longitudinal members having, between them, steps arranged perpendicularly with respect thereto and, in order to be used, are frequently rested against a vertical object such as, for example, a tree, a pole and the like. Since very often there is not a sufficiently firm and/or substantially flat support surface for the ladder, climbing up onto the uppermost rungs of the said ladder is often very dangerous due to the fact that the ladder may slip on the vertical object forming the support, tipping over sideways.

[0003] In order to avoid this danger, when operations are performed on soft and/or inclined ground, two persons are required, one of them not climbing up the ladder and keeping hold of it so as to prevent potentially dangerous movement or slipping thereof. However, even when these precautions are taken, it is not always possible to prevent dangerous accidents from happening.

[0004] It has occurred to the inventor of the present invention that, in order to eliminate the abovementioned dangers, it would be necessary to provide a ladder which has simple, reliable and easily disengageable means able to fix it securely to the vertical object against which it is rested.

[0005] For this purpose, the inventor has devised a ladder in which elements with two sides, shaped substantially in the form of an "L", are mounted on the free end of the vertical longitudinal members of the ladder, said elements being designed and made in such a way that, when the ladder is moved up against the said vertical object acting as a support, these elements, rotating with respect to the said longitudinal members, are arranged so as to form with the highest step of the ladder a broken line which is formed by three adjacent segments in contact with the vertical object and which encloses inside it, embracing it, at least part of the cross section of the vertical object in the zone of the latter against which the ladder is rested.

[0006] Other technical characteristics and further features which ensure the full reliability of a ladder according to the invention will be described in greater detail hereinbelow.

[0007] The subject of the present invention therefore consists in a portable ladder as described in the accompanying Claim 1.

[0008] Two examples of embodiment of the ladder according to the invention, chosen from among the various possible embodiments which may occur to a person skilled in the art on the basis of what is described in the

forementioned Claim 1, will now be described in greater detail, as anticipated.

[0009] In the description which follows, reference will also be made to the accompanying drawings in which:

- Figure 1 shows a top plan view of a first example of embodiment of the ladder according to the invention at the moment when it is placed against a vertical object consisting of a tree (shown in cross section for greater clarity);
- Figure 2 shows a top plan view of the ladder according to Figure 1 after it has been placed against the abovementioned tree and its L-shaped elements have been secured thereto;
- Figures 3 and 4 are two views similar to those of Figures 1 and 2, but referring to another example of embodiment in which the two L-shaped elements are joined together so as to be able to rotate and be displaced relative to each other;
- Figure 5 shows a front view of a ladder according to Figures 1 and 2;
- Figure 6 shows a front view of the upper end of a longitudinal member of a ladder according to the invention, to which one of the L-shaped elements is fixed.

[0010] If we consider firstly Figure 1, this shows a ladder 1 according to the invention. The upper ends 2s, 3s of its longitudinal members 2, 3 have, mounted on them, two substantially L-shaped elements 5, 6 in a mirror arrangement, fixed to the ladder 1 so as to be able to rotate about the points of intersection of their respective sides 5a, 5b, 6a, 6b.

[0011] Two resilient members, in this case two springs 8, 9, keep said elements, when the ladder 1 is not resting against a vertical object 7 (which in this case is a tree), in the position shown, namely with the two sides 5b, 6b diverging from each other so as to allow the ladder to be rested against the tree 7 and with the other two sides 5a, 6a perpendicular thereto converging so that their free ends are oriented in the direction of the tree 7 with a predefined inclination α .

[0012] When the ladder 1 is moved towards the tree 7, it is the said two free ends which come into contact first against the latter, that is, before the highest step 4h comes into contact with the said tree 7. When the ladder 1 is rested against the latter, the two abovementioned sides 5b, 6b are pushed by the reaction P exerted by the tree 7 and rotate (arrows C), causing rotation also (arrows R) of the other two sides 5a, 6a about their above-described points of intersection and overcoming the resistance of the above-mentioned springs 8, 9.

[0013] Consequently, when the abovementioned highest step 4h of the ladder rests against the tree 7, the said two sides 5b, 6b are arranged so as to form with the step 4h in question a broken line L (as shown in Figure 2), formed by three adjacent segments A, B, C in contact with the external surface of the tree 7, this bro-

ken line L containing inside it, "embracing it", at least part of the cross section of the said tree 7.

[0014] In Figures 1 and 2, this broken line L is practically closed so as to form a triangle since the cross section of the tree 7 has relatively small dimensions. In the case of trees with a larger diameter (example not shown), the said sides 5b, 6b may not converge as shown in the figures, but may be parallel or even diverging, and the said broken line L may enclose only part of the cross section of the tree trunk, while still ensuring secure transverse fixing of the ladder 1.

[0015] The weight of the user, increasing the pressure exerted by the tree 7 on the said two sides 5a, 6a which come into contact with the said tree first, instead of diminishing the stability of the ladder 1, improves it since the said weight also consequently increases the force which the other two sides 5b, 6b exert against the tree 7. The object pre-set by the inventor is thus attained, namely that of providing a ladder 1 provided with means which secure it stably to the vertical object 7 against which it is resting, irrespective of the consistency and the configuration and inclination of the ground T on which it is positioned.

[0016] In order to increase the contact pressure between the said two sides 5b, 6b which form a broken line and the vertical object 7, the inventor has envisaged curving them slightly and/or mounting or forming on them one or more projections 17, 18 or teeth (not shown) directed towards the said vertical object 7. In the case where the latter is metallic or in any case has an external surface with a low coefficient of friction, the inventor envisages covering the abovementioned sides 5b, 6b, partly or completely, with a lining of material having a high coefficient of friction. This measure is not illustrated in the drawings since it may occur in an obvious manner to a person skilled in the art.

[0017] When the ladder 1 is moved away from the tree 7, the said springs 8, 9 bring the two elements 5, 6 back into their initial position.

[0018] Figures 3 and 4 show another example of embodiment of a ladder 101 according to the invention, operation of the various parts of which is identical to that described for the preceding embodiment.

[0019] Here also two sides 105b, 106b form a broken line L with three segments A, B, C in contact with the vertical object 7, the sole difference being that the figure formed by the said broken line L has a trapezoidal shape.

[0020] All the component parts are also similar and perform similar functions, with the sole difference that the two sides 105a, 106a of the two L-shaped elements 105, 106 which are pressed by the vertical object 7 are joined together by means which nevertheless allow them to be displaced and rotated with respect to each other.

[0021] In the example in question, these means consist of two through-grooves 14, 15 parallel to the longitudinal axes of the respective sides and passed through

by a threaded fixing member, which may even be a simple bolt 16 provided with nut and lock-nut, dimensioned and tightened so as to be able, nevertheless, to slide and rotate inside the said grooves. It is thus possible to have a single device which can be fitted onto a ladder and comprises both the elements 105, 106 described.

[0022] Both in this case and in the preceding example, in order to allow greater versatility of use with vertical objects having different dimensions, the inventor envisages providing a part 105p, 106p (Figures 3 and 4) of the said two sides 105b, 106b which form a broken line, so as to be slidable perpendicularly with respect to the other sides 105a, 106a, as well as means for reversible fixing thereof in a desired position. This may be obtained by forming, in each of the sides, a cavity 10, 11 (Figure 3) inside which the said parts 105p, 106p are slidably inserted and may be fixed in the desired position also using simple locking grub-screws 12, 13 (see in this connection Figures 3 and 4).

[0023] In both the cases considered hitherto, in order to fix the L-shaped elements 5, 6, 105, 106 onto the ends of the associated longitudinal members 2, 3, the inventor suggests forming or mounting on each of the latter an end-piece 19, as shown in Figure 6, which is perpendicular to the respective two sides of the element and situated in the vicinity of the point of intersection or connection between the two said sides.

[0024] These end-pieces 19 must be provided with dimensions so as to penetrate with their whole length inside a hollow portion 20 formed or mounted on the end of the respective longitudinal members 2, 3. Since the latter consist, in most cases, of a hollow tubular section with a quadrangular cross section, it is sufficient to manufacture the said end-pieces 19 so that they have a cross section with a matching shape allowing them to penetrate, without excessive play, inside the cavity of the said longitudinal members. Obviously it is advantageous if the end-pieces 19 are also easily extractable so that the ladder may be used also without the said L-shaped elements when the latter not required.

[0025] It should be noted that it is convenient to form, on each of the end-pieces 19, a projecting contact piece 21, as can be seen in Figure 6, onto which one end of the springs 8, 9 described above may be fixed. The other end of each spring is connected to the side 5b, 6b (or 105b, 106b) of the respective element 5, 6 (or 105, 106), which when it rotates forms a broken line, so as to ensure that this spring, when the ladder 1 is moved away from the vertical supporting object 7 and the latter no longer exerts any force on the sides of the elements 5, 6, 105, 106, recalls the element to which it is connected into the initial position which it occupied before resting the ladder 1 against the said vertical object 7.

[0026] The said rotation of the elements 5, 6, 105, 106 with respect to the ends 2s, 3s of the respective longitudinal members may be performed using one of the numerous systems known to persons skilled in the art. For example, each element may be fixed onto its end-piece

19, when it is present, using simple threaded bolts 22 combined with a washer/nut/lock-nut system as illustrated more clearly in Figure 6.

[0027] However it is constructed, a ladder 1 according to the present invention allows a single person to use it with the maximum safety against the risk of accidents since it is automatically and reliably secured to the vertical object 7 against which it is rested, as shown in Figure 5.

Claims

1. Portable ladder (1, 101), in particular suitable for maintenance and gardening work during which it may be rested against a vertical object (7), composed of two longitudinal members (2, 3) between which several steps (4i) connected perpendicularly with respect thereto are located, **characterized in that** each of the upper ends (2s, 3s) of the said longitudinal members (2, 3) which do not have to rest on the ground (T) has, fixed to it, an element (5, 6, 105, 106) with two sides (5a, 5b, 6a, 6b, 105a, 105b, 106a, 106b) which is shaped substantially in the form of an "L" contained in a plane approximately perpendicular to that of the said two longitudinal members (2, 3), the two elements (5, 6, 105, 106) fixed onto the same ladder (1, 101) being substantially the mirror image of each other and being able to rotate perpendicularly with respect to the above-mentioned longitudinal members (2, 3) when one (5a, 6a, 105a, 106a) of their two sides is pressed against the said vertical object (7), being arranged so as to form, together with the step (4h) of the ladder (1, 101) located highermost, a broken line (L) which is formed by three adjacent segments (A, B, C) in contact with the external surface of the above-mentioned vertical object (7) and which comprises inside it, embracing it, at least part of the cross section of the said vertical object (7) in the zone of the latter against which the ladder (1) is rested.
2. Ladder according to Claim 1, in which each of the said elements (5, 6, 105, 106) with two L-shaped sides is provided with a resilient member (8, 9) able to recall it, when the ladder (1) is moved away from the said vertical object (7), into the position which it occupied before one of its sides was pressed by the latter.
3. Ladder according to one of the preceding claims, in which a part (105p, 106p) of each of the said two sides (105b, 106b) forming the said broken line (L) is provided with means (10, 11) which allow it to slide perpendicularly with respect to the other side (105a, 106a) and also with means (12, 13) for reversible fixing thereof in a desired position.
4. Ladder according to one of the preceding claims, in which the sides (105a, 106a) of the elements (105, 106) which are pressed against the said vertical object (7) are connected together by means (14, 15, 16) which allow them to slide and rotate simultaneously with respect to each other.
5. Ladder according to Claim 4, in which the said means which allow the said two sides (105a, 106a) of the elements (105, 106) to slide and rotate with respect to each other consist of two through-grooves (14, 15) parallel to the longitudinal axes thereof and of a threaded fixing member (16) which passes through them and which may be freely displaced and rotated inside them.
6. Ladder according to one of the preceding claims, in which the sides (5b, 6b, 105b, 106b) of the elements (5, 6, 105, 106) which form, together with the highest step (4h) of the ladder (1), the said broken line (L) have one or more projections (17, 18) or teeth which are directed towards the said vertical object (7) when the ladder (1, 101) is rested against it.
7. Ladder according to one of the preceding claims, in which the said two sides (5b, 6b, 105b, 106b) forming, together with the highest step (4h), the said broken line (L) are slightly curved.
8. Ladder according to one of the preceding claims, in which at least part of the said two sides (5, 6, 105, 106) is covered with a lining of material with a high coefficient of friction.
9. Ladder according to one of the preceding claims, in which each of the said two elements (5, 6, 105, 106) is provided with an end-piece (19) perpendicular to the plane of its two sides and able to penetrate without play into a hollow portion (20) formed in or mounted on the free end (2s, 3s) of the said longitudinal members (2, 3).

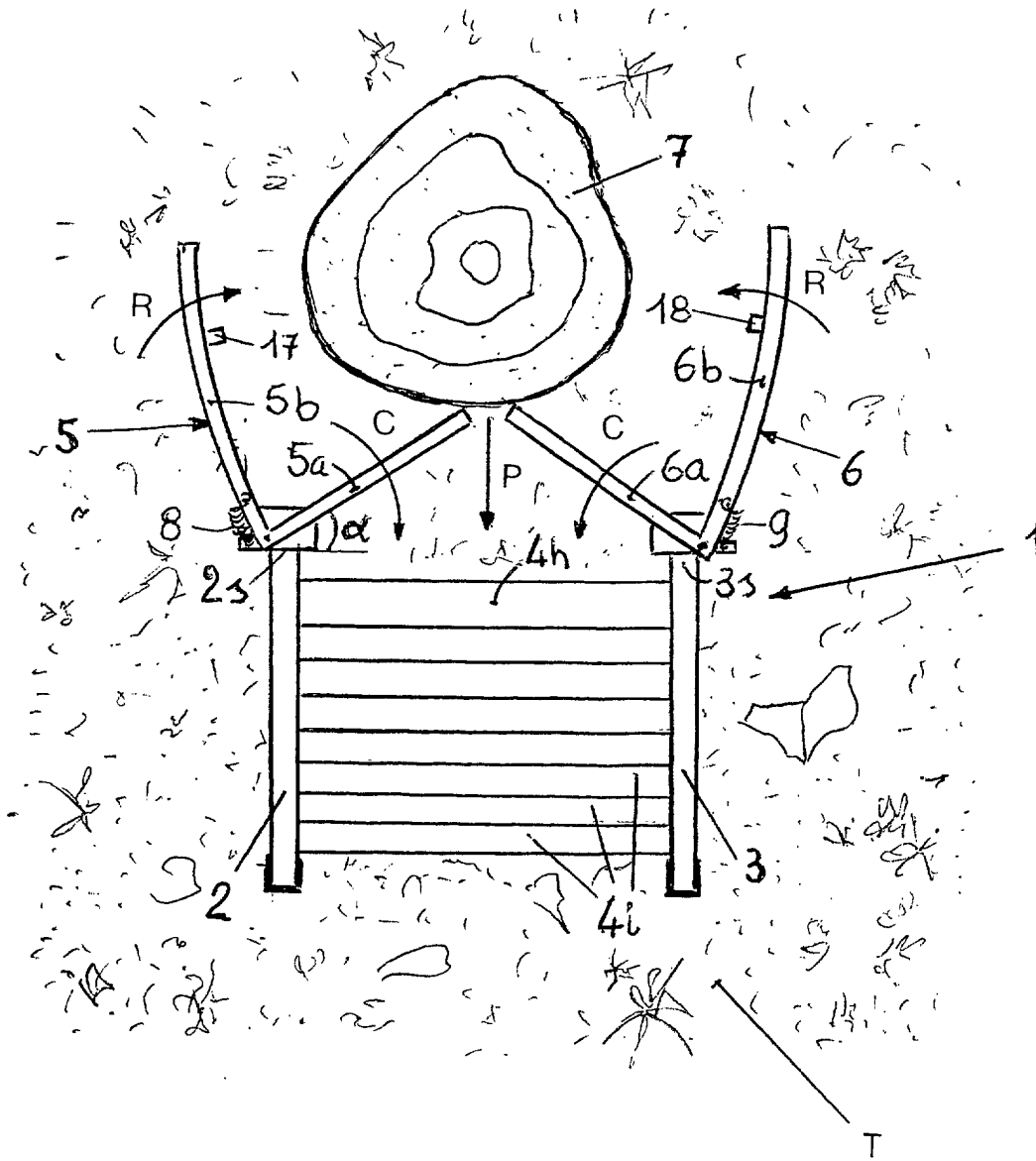


FIG. 1

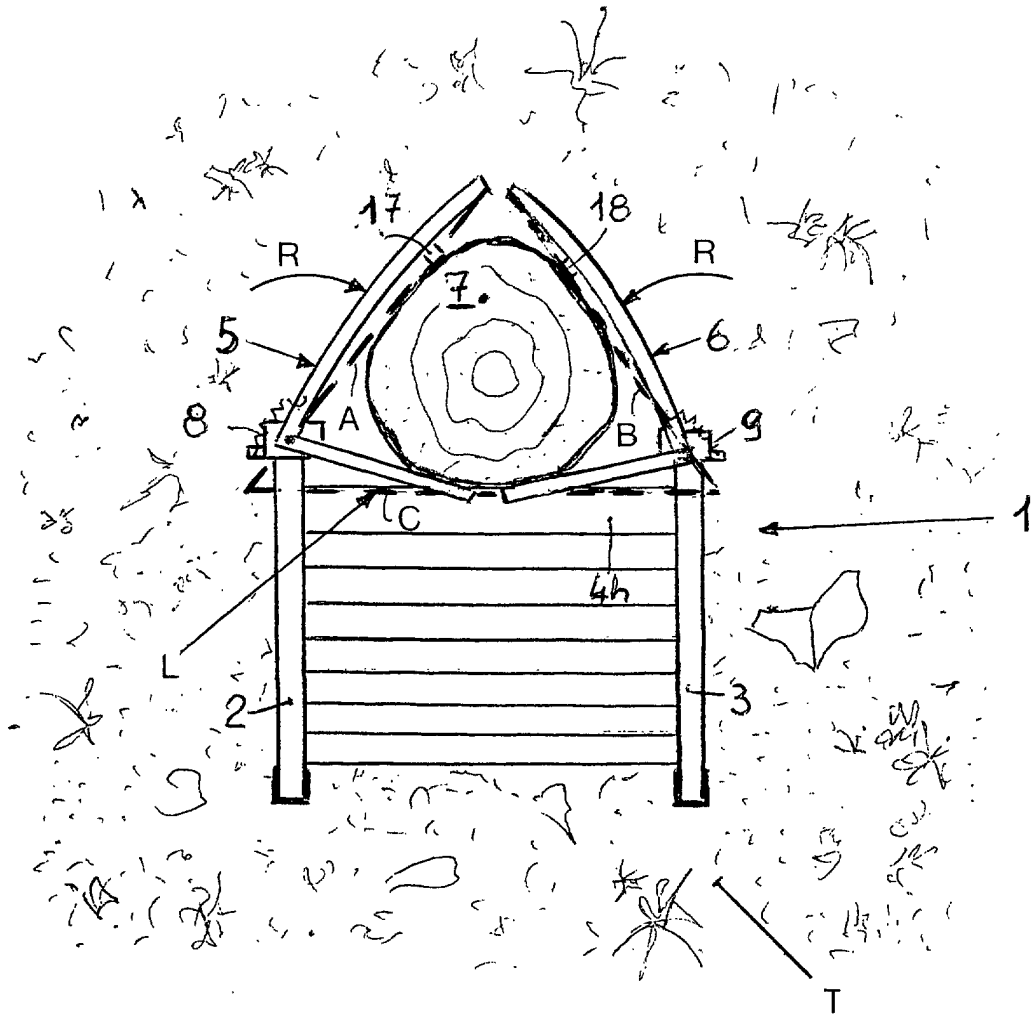


FIG. 2

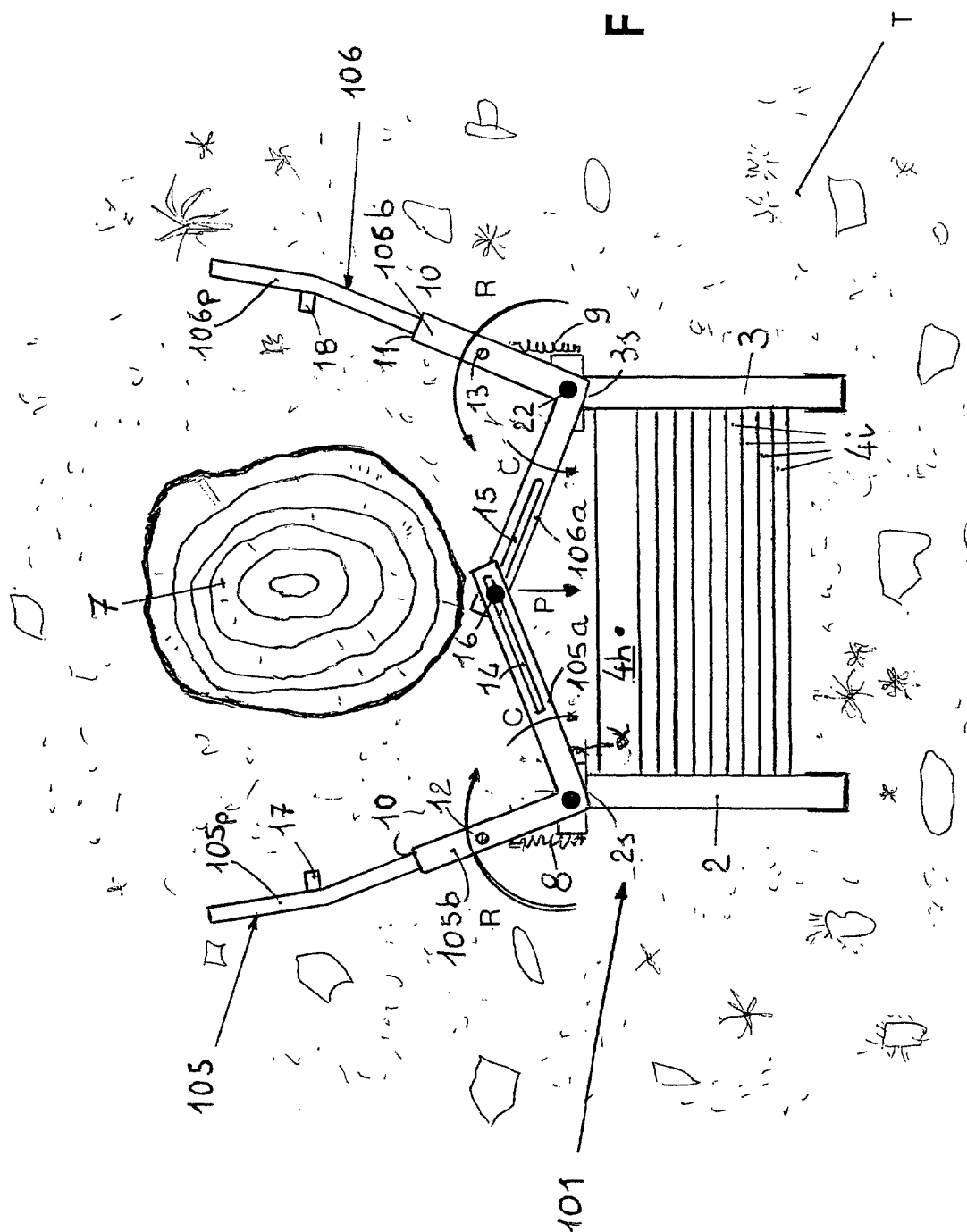
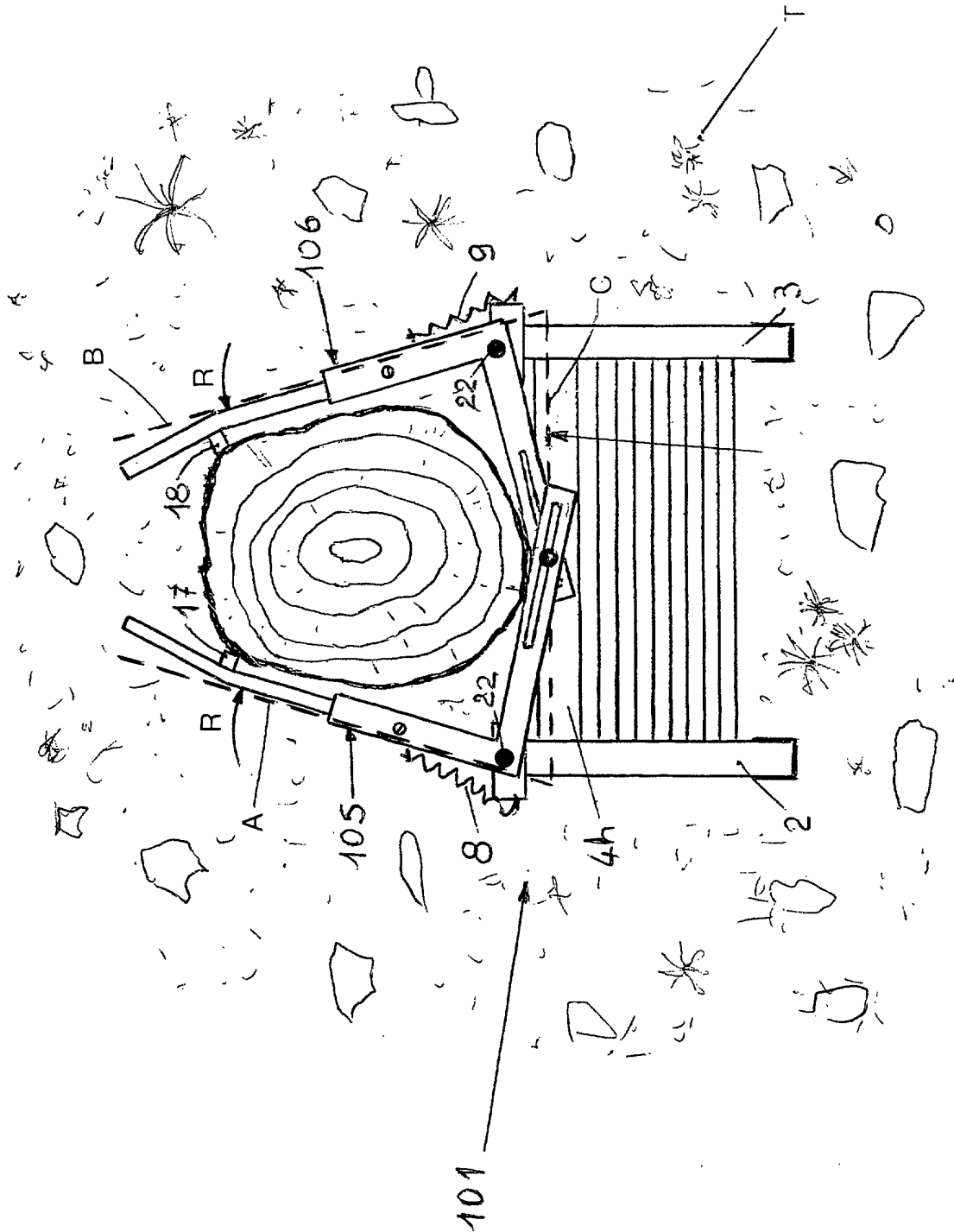


FIG. 3

FIG. 4



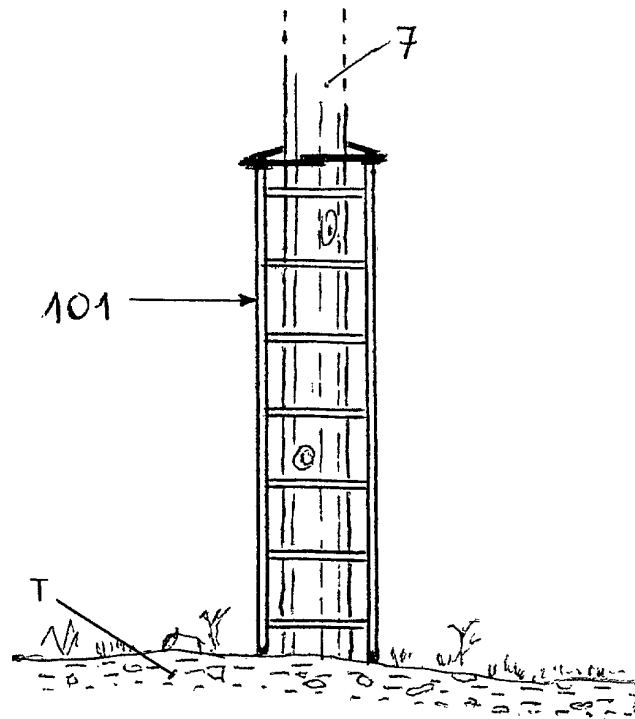


FIG. 5

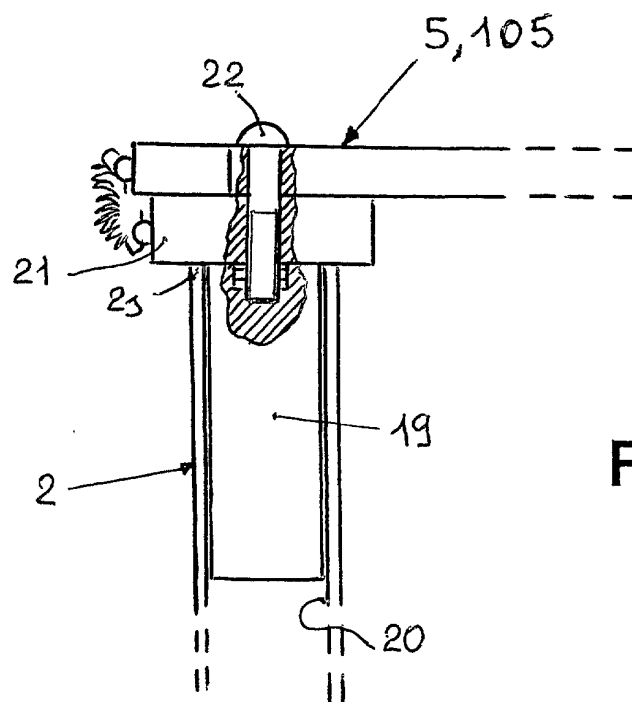


FIG. 6



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EUROPEAN SEARCH REPORT

Application Number
EP 01 81 1094

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.CI.7)
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The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.CI.7) E06C
Place of search THE HAGUE		Date of completion of the search 8 April 2002	Examiner Demeester, J
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EP 01 81 1094

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