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(54) **Method and apparatus for fixing the tail end of wrappings of palletized loads**

(57) The tail end (X) of the wrapping film, gathered in a bundle, is gripped in synchronism by a secondary gripper (PS) designed to be able to perforate subsequently, by itself or with the aid of suitable means, a wall of the pocket (S) formed in the terminal part of the wrap-

ping film and, when this gripper has entered with the tail end into the pocket, it opens so as to release the said tail end and then exits through the entry hole (F), leaving the tail end inside the pocket which is then eliminated and closed so as to fix inside it the said tail end of the wrapping.

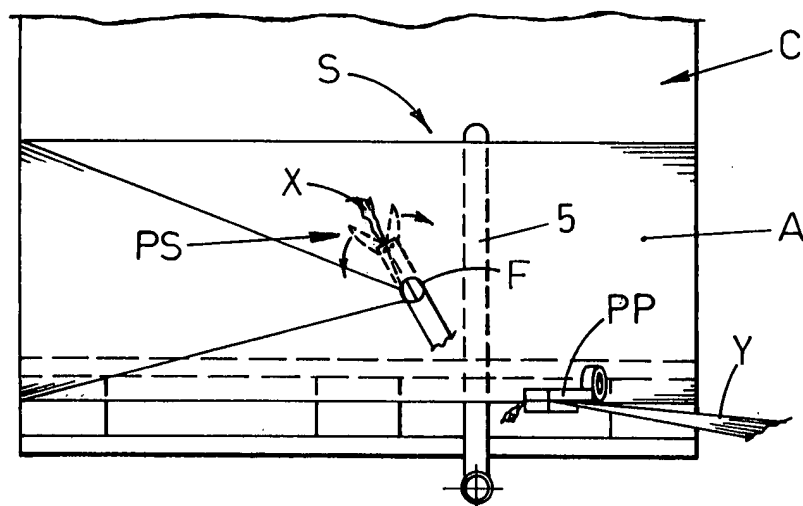


Fig.4a

Description

[0001] The invention concerns an apparatus and the associated method and system for fixing, without welding, the tail end of wrappings of palletized loads, formed using stretch film and/or other elastic and/or plastic material and using any wrapping machine of the known type.

[0002] In order to perform this type of fixing, apparatus of different types are currently known, all of said apparatus, however, with the aid of means which are more or less different from each other, performing insertion of the tail end of the wrapping film from the top or the bottom of a pocket created in the end part of the wrapping by an opposition means which keeps part of the last turns of the said wrapping suitably spaced from the load, following which the said insertion means emerge open from the pocket, leaving inside the latter the tail end of the wrapping, and then the said opposition means leaves the said pocket which, owing to the elasticity of the material forming it, closes and firmly retains inside it the tail end of the wrapping. This mode of operation produces satisfactory results, but requires, however, relatively long execution times. The invention intends to overcome this and other limitations of the known art, using the following new method. The tail end of the wrapping film, gathered in a bundle, is gripped in synchronism by a gripper designed to be able to perforate subsequently, by itself or with the aid of suitable means, a middle part of the said pocket formed in the wrapping film and, after this gripper has entered with the tail end inside the pocket, it opens so as to release the said tail end and then exits from the pocket through the entry hole, leaving the tail end inside it. The forward and return movements of this novel gripper are decidedly shorter and therefore faster than those of grippers of the known type which introduce the tail end via the top opening or bottom opening of the pocket. The new method moreover offers the advantage that the tail end of the film is immediately retained with friction by the hole formed in the pocket of film into which it was introduced, this condition not being able to be achieved using the known methods, unless specific means such as pressers, air jets or the like are provided. Preferably it is also envisaged that introduction of the tail end into the pocket is performed along a section of the said pocket which is then acted on by the opposition means during the movement when it is retracted and comes out of the said pocket, so that said means interferes with the tail end of the film in such a way as to smooth it and/or position it correctly inside the pocket during the closing step.

[0003] Further characteristic features of the invention and the advantages arising therefrom will emerge more clearly from the following description of a preferred embodiment thereof, illustrated purely by way of a non-limiting example, in the figures of the accompanying sheets of drawings in which:

- Figs. 1 and 2 show, viewed laterally and with parts cross-sectioned, different embodiments of the secondary gripper intended to grip and introduce the tail end into the pocket of the wrapping film;
- Figs. 3, 4 and 3a, 4a are, respectively, a top plan view and side elevation view of certain working steps performed by the apparatus;
- Fig. 5 shows a side elevation view of the further final working steps performed by the apparatus in question.

[0004] In Figure 1, PS denotes a possible simplified embodiment of the secondary gripper useful for implementing the method in question, which comprises a rod-shaped body 1, for example with a round cross-section or other suitable cross-section, having a smooth surface, which has pivotably mounted on its end, on one or on respective parallel pivots 2, 2', pointed jaws 3, 3' which, when they are closed as shown in continuous lines, resemble substantially an ogive with a pointed form. The gripper PS in Figure 1 is intended to perforate itself the pocket of the wrapping film so as to introduce therein the tail end of the said wrapping. The gripper comprises internal means for the self-centring opening or closing movement of the said jaws 3, 3', as illustrated in broken lines. These movement means may, for example, comprise pinions and a rack actuated in a reciprocating manner by a fluid pressure cylinder, said means having been used for some time for actuating mechanized grippers and for this reason not being shown in the drawings in that they may be easily realized by persons skilled in the art.

[0005] Figure 2 shows another possible embodiment of the secondary gripper PS which may be used in place of that shown in Figure 1. This solution comprises a gripper substantially similar to that shown in Figure 1, but with jaws which may also not be pointed, and movable axially inside a hollow body 4, the front end 104 of which has, for example, the form of a single or double flute tip, hence with a single oblique surface as illustrated in the drawings or with two oblique and opposite surfaces and therefore provided at its end with one or two lateral openings. During gripping of the tail end of the film, the gripper PS is outside the body 4, its jaws are initially open as shown in broken lines and are then closed and the said gripper is then retracted into the laterally open part of the body 4, as illustrated in continuous lines, so as to leave the pointed end 104 of the said body 4 free and visible. In this condition the whole system 4-PS is displaced axially so as to perforate the pocket and introduce therein the tail end of the said wrapping, after which the gripper PS is extended outside the body 4, is opened and then retracted and closed again within the said body 4, all of which so that during the subsequent extraction of the system from the pocket of the wrapping, said system has an external surface which is that of body 4, being perfectly smooth, continuous and devoid of small interruptions and irregularities which are nec-

essarily present in the solution according to Figure 1 in the zone where the jaws are joined to the body 1 and which could cause undesirable friction during extraction of the system from the pocket of the wrapping (see below).

[0006] In addition to the secondary gripper PS as mentioned above, which will be equipped with special means for movement relative to the wrapping of the palletized load, as mentioned further below, the apparatus comprises the following means which are now described with reference to Figures 3 and 3a and which are for example of the type already used in the apparatus described in European patent EP 1 037 801 B1 and in European patent application No. 03 027074.8 both in the name of the present Applicants, to which documents detailed reference will be made. In Figures 3 and 3a, C denotes the palletized load which is enveloped by the wrapping of stretch film A and on the side of which an opposition rod 5 at the end of the cycle is raised from the rest position shown in broken lines into the active position shown in continuous lines, said opposition rod causing the movement, away from the load, of at least one of the last turns of the wrapping film, so as to form a pocket S between this turn and the load. Preferably it is envisaged that at least the turn or turns of film which form the pocket S are formed by film, the height of which has been suitably reduced and for this reason is tensioned and has a greater mechanical strength. Once the pocket S has been formed, means are envisaged for stopping the last section of the wrapping film which, on the one hand touches the load and on the other hand is connected to the feeding means (not shown) situated practically next to the pocket S. A middle zone of this section of film is gathered together transversely in a bundle, for example by means of the displacement from the top downwards of any suitable means, for example the open secondary gripper PS, while the bottom edge of the said section of film is retained at the bottom by a locating element 6 and by a bottom component 7 of the primary gripper PP which in synchronized sequence closes, as does the said secondary gripper PS. It is understood that the bundling together of the last section of the wrapping film may be performed by means other than the jaws of the secondary gripper, for example by a pair of parallel forks made of round metal bar and mounted on a body which is designed to be longitudinally slidable on the body 1, 4 of the said secondary gripper, so that these forks may be arranged adjacent to the jaws of the gripper during bundling together of the tail end and gripping and so that they may be subsequently moved away so as to free the tip of the secondary gripper for the subsequent working steps.

[0007] In sequence with the above mentioned steps (Figs. 3, 3a), the intervention of special cutting means 8 associated for example with the primary gripper PP is activated, said means cutting the end section of the film between the said primary gripper and the secondary gripper PS so that the latter retains the tail end X of the

film of the wrapping which is about to be completed, while the primary gripper PP retains the front end of the film Y for the following wrapping which the machine will perform on the next load. In synchronized sequence (Figs. 4, 4a), the secondary gripper PS, by means of combined movements, is introduced together with the tail end X into a middle section of one of the two walls of the pocket S, preferably at a point on the pocket which is sufficiently close to the opposition means 5 and hence sufficiently deep, to avoid any interference with the load C, following which the said secondary gripper PS is opened and is extracted from the pocket, while the tail end X remains inside the said pocket owing to contact with the film which forms the pocket and the contact with the edge of the hole F formed in the said pocket by the secondary gripper which in synchronism closes so as to prevent the jaws interfering with the film of the pocket (Fig. 5). Preferably, it is envisaged that the insertion of the tail end into the pocket S is performed by means of perforation of that wall of the said pocket which is subsequently acted on by the opposition means 5 when the latter is retracted for example by means of pivoting downwards, as shown in Figure 5, so that this opposition means performs a kind of smoothing action on the tail end so as to arrange it correctly and retain it inside the pocket which in synchronism closes and grips inside it the said tail end of the completed wrapping. The secondary gripper PS returns into the rest position, the wrapped load is moved away from the wrapping station and the machine is ready to repeat a new working cycle.

Claims

1. Method for fixing, without welding, the tail end of the wrapping of palletized loads, formed using stretch film and/or other elastic and/or plastic material and using wrapping machines of any known type, **characterized by** the sequence of following operating steps:
 - formation in the end part of the wrapping (A) of the palletized load, laterally with respect to the said load, a pocket (S) formed by one or more turns of the wrapping film, if necessary having a reduced width so as to be stronger;
 - stopping of the tail end of the wrapping opposite said pocket (S), transverse bundling together of a middle section of the said tail end, gripping of the bundle by a main gripper (PP) and a secondary gripper (PS) which is closer to the wrapping, cutting of the bundle along the section between the two grippers so that the tail end (X) of the wrapping is retained by the secondary gripper and so that the front end (Y) of the future wrapping is retained by the primary gripper;
 - lateral perforation of a wall of the pocket (S) and insertion or injection therein, through the hole

(F), of the tail end (X) of the wrapping retained for example by the secondary gripper which subsequently opens and returns outside the pocket while the said tail end of the wrapping remains inside the latter;

- elimination and closing of the pocket (S) of the wrapping with definitive fixing inside it of the tail end of the wrapping film.

2. Apparatus for fixing, without welding, the tail end of the wrapping of palletized loads, formed using stretch film and/or other elastic and/or plastic material and using wrapping machines of any known type, particularly for implementing the method according to the preceding claim, **characterized in that** it comprises:

- a straight opposition rod (5) which, during the final stage of the wrapping cycle, is arranged more or less vertically and is brought up alongside the part of the load where the said wrapping is about to be completed, at the correct distance from the said load, so as to ensure at least the last turn of the wrapping rests against this rod so as to create alongside said wrapping a pocket (S) of suitable width;
- means for stopping the wrapping machine when the last section of the wrapping is at a short distance from the said pocket (S) with the associated internal rod which keeps it formed;
- means for transversely bundling together at least one middle zone of the last section of the wrapping and a secondary gripper (PS) and primary gripper (PP) for retaining successive portions of the said bundle of film, these grippers being arranged at a short distance from each other and the secondary gripper being situated closer to the wrapping;
- means (8) for cutting the section of film along the section between the said grippers (PS, PP) so as to define the tail end of the wrapping (X) which is retained by the secondary gripper (PS) and the front end (Y) of the future wrapping which is retained by the main gripper (PP);
- means for perforating a wall of the said pocket (S) laterally and in the middle and for inserting into the said pocket, through the hole (F) formed, the secondary gripper (PS) with the tail end of the wrapping, means being envisaged for opening this gripper subsequently and for then extracting it from the pocket, while the said gripper is closed again and while the tail end remains within the pocket, also as a result of adhesion to the edge of the hole (F) through which it was inserted;
- means which in synchronized sequence with the means according to the previous paragraph extract from the pocket (S) the opposition rod

(5) which formed it and bring this rod into the rest position so that, owing to the elastic memory effect of the wrapping film, the said pocket is closed and eliminated, becoming a taut part of the wrapping and retaining inside it the tail end of the said wrapping.

3. Apparatus according to Claim 2, in which means are envisaged for ensuring that the secondary gripper (PS) is inserted through a middle point in a wall of the pocket (S) which is sufficiently close to the opposition rod (5) and which is therefore sufficiently deep.

4. Apparatus according to Claim 2, in which means are envisaged for ensuring that the secondary gripper (PS) is inserted through a middle point in that wall of the pocket (S) which is subsequently acted on by the opposition rod (5) when it performs its retracting movement out of the said pocket, so that this rod performs a kind of smoothing action and correctly arranges and retains the tail end of the film inside the pocket while the latter is closed.

5. Apparatus according to Claim 2, **characterized in that** it comprises preferably means for ensuring that at least the turn or turns of film which form the pocket (S) are formed with film, the height of which has been suitably reduced and which therefore among other things also has a greater strength.

6. Apparatus according to Claim 2, in which the secondary gripper (PS) is intended to perforate the pocket (S) of the wrapping film so as to introduce therein the tail end (X) of the said wrapping and comprises a rod-shaped body (1), for example having a round cross-section or other suitable cross-section, with a smooth surface, which carries pivotably mounted on its end, on one or more respective parallel and transverse pivots (2, 2'), pointed jaws (3, 3') which, when they are closed, resemble substantially an ogive with a pointed form, means being envisaged in the said body (1) for the self-centring closing or opening movement of the said jaws (3, 3').

7. Apparatus according to Claim 2, in which the secondary gripper (PS) comprises a rod-shaped body (1) which has, pivotably mounted on its end, jaws (3, 3') and which has internally means for the self-centring closing or opening movement of the said jaws (3, 3'), this assembly being movable axially inside a hollow body (4) for example having a round cross-section and a smooth external surface, the front end (104) of which has for example the form of a single or double flute tip, hence with a single oblique surface or with two oblique and opposite surfaces and therefore provided at its end with one

or two lateral openings, all of which being envisaged to ensure that the said jaws (3, 3') may be positioned closed at the lateral end opening of the said tubular body (4), for the steps of introducing and extracting the gripper into and from the pocket (S) of the wrapping, and that the said jaws may be arranged open outside or beyond the cutting and pointed end of the said body (4) for the steps of gripping the tail end of the wrapping at the moment when the said tail end is formed and for the subsequent release of the said tail end inside the said pocket (S) of the wrapping.

8. Apparatus according to Claim 2, in which bundling together of the tail end of the wrapping film is performed by the jaws of the secondary gripper (PS).
9. Apparatus according to Claim 2, in which bundling together of the tail end of the film for correct gripping by the jaws of the secondary gripper is performed by special and specific means which operate in synchronism with this gripper (PS).
10. Apparatus according to Claim 9, in which bundling together of the tail end of the film for correct gripping by the jaws of the secondary gripper (PS) is performed by forks made of round metal bar and mounted on a body which is designed to be slidable longitudinally on the body (1, 4) of the said secondary gripper so that these forks may be arranged next to the jaws of the gripper during bundling together of the tail end and gripping and so that they may then be moved away so as to free the tip of the secondary gripper for insertion and extraction into and from the pocket (S) of the wrapping.
11. Apparatus according to the preceding claims, **characterized in that** it comprises opposition means (6, 7) which operate along the edge of the tail end of the wrapping which is opposite to that acted on by the means for bundling together the said tail end.
12. System for fixing the tail end of wrappings of palletized loads, formed using stretch film and/or other elastic and/or plastic material and using wrapping machines of any known type, **characterized in that** the tail end of the wrapping is inserted inside the said wrapping, through a hole, a cut or other small breach created in the end part of the said wrapping.

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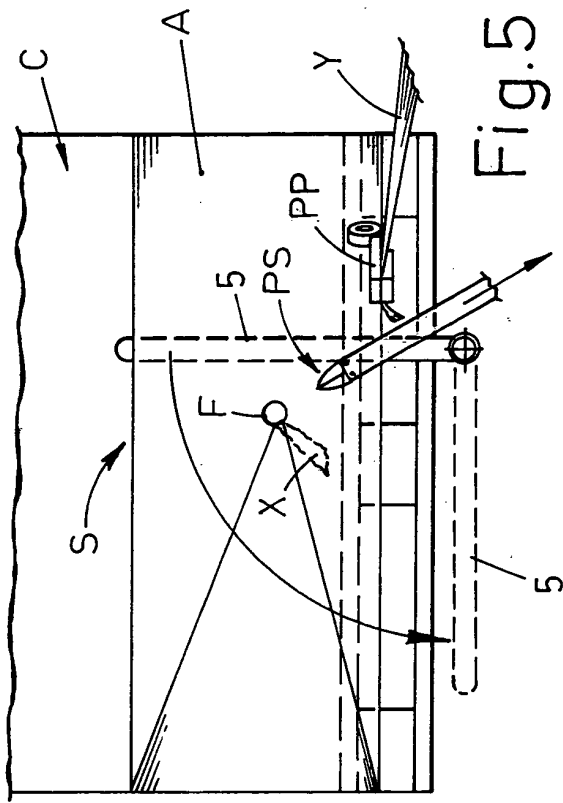


Fig.5

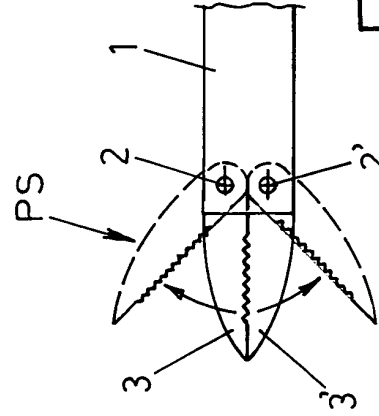


Fig.1

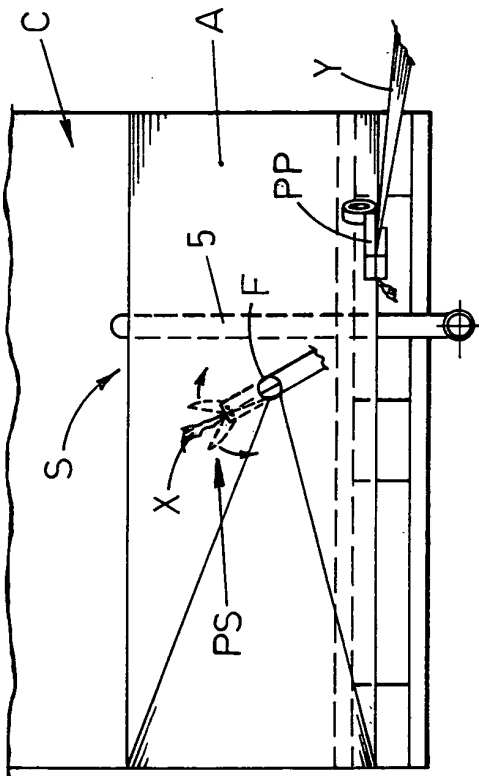


Fig.4a

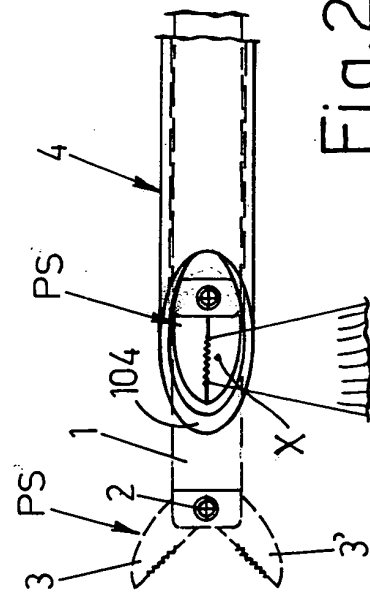
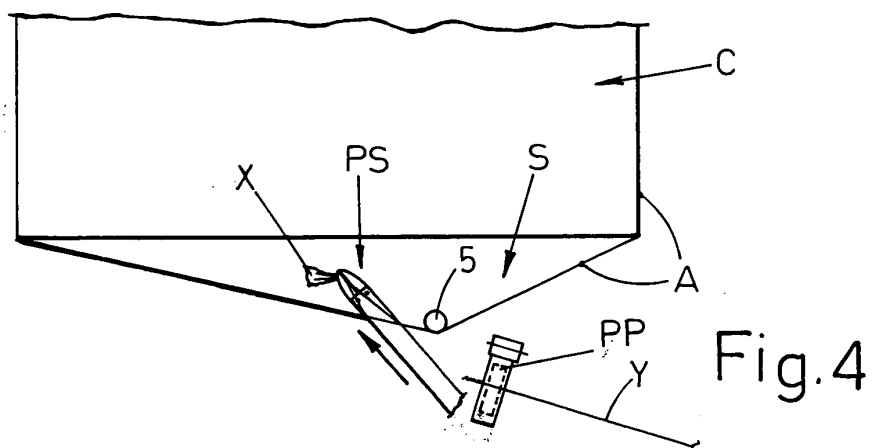
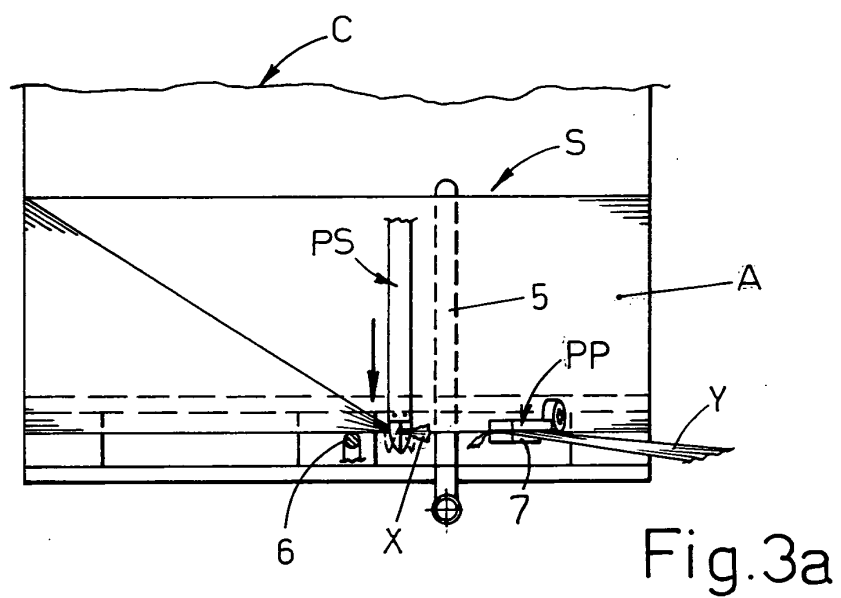
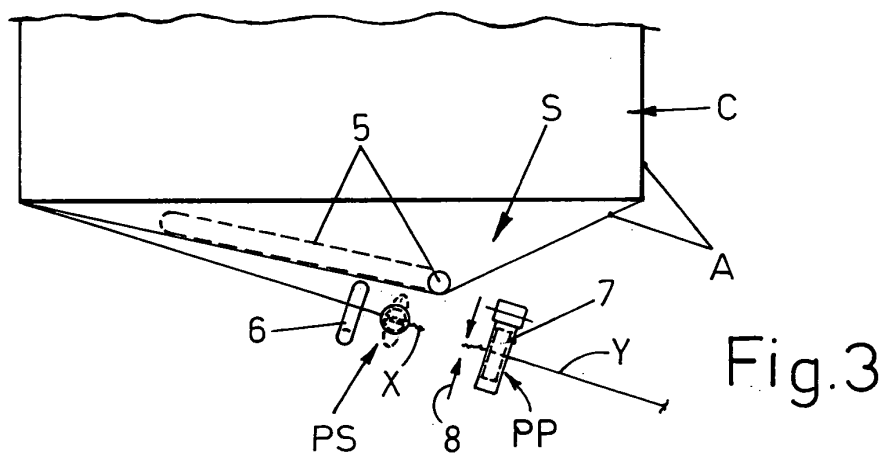


Fig.2





European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 04 00 1541

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 5 July 2004	Examiner Ungureanu, M
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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