Method and apparatus for manufacture of a padded element, particularly for a motor-vehicle seat

Méthode und Gerät zur Herstellung eines gepolsterten Elementes, insbesondere für einen Fahrzeug sitz

Méthode et dispositif pour la fabrication d'un élément rembourré, en particulier pour le siège d'un véhicule automobile

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Description

The present invention generally refers to padded elements used in motor-vehicles, comprising a padding body, usually made of foamed plastic material, and a cover applied thereon. The invention particularly relates to a method and apparatus for manufacture of a padded element, particularly for a motor-vehicle seat, of the type wherein a cover is applied onto a padding body and the cover is formed according to the shape of the surface of the padding by pressing in a mould and simultaneous application of a flow of steam. The invention however applies also to other padded elements used in motor-vehicles, such as door panels, roof panels, dashboard panels.

By the term "padded element" of a motor-vehicle seat, reference is made in the present description and in the following claims either to the seat portion or the backrest portion of the seat. This element is formed by a padding body, usually made of foamed plastic material, on which there is applied a cover (made of fabric, skin, or synthetic material) which may be provided on its back with a relatively thin and soft layer of foamed plastic material.

According to the most conventional technique, the padding body of the seat element is covered with a fabric which is secured to the body of foamed plastic material by sewing or by means of an adhesive material or by fixing elements which connect the cover to the body of foamed plastic material. This last two techniques have the advantage, with respect to the most conventional technique which provides the sewing of the cover, to be more adapted to a gross production and to allow in particular the manufacturing process to be automated, while enabling the production of complex anatomical shapes, which answer to ergonomic and comfort needs. On the other hand, said known process imply the risk which following the connection of the covering fabric to the surface of the padding element, the fabric is torn, if it is not elastic.

In order to solve this problem, it has been proposed to use a thermo-formable material for covering the padding of foamed plastic material. This fabric is initially heated and then formed according to the desired shape by cold pressing in a mould. The fabric formed thereby is then connected to the body of foamed plastic material. This known method however has the drawback of requiring the use of a thermo-formable fabric, which is of a relatively high cost, and to prevent the use of fabrics having decorative designs, since such designs are deformed in the thermo-forming operation.

A solution to the problem of providing a cushion with a complex shape while adopting a regular unelastic fabric as a cover, and avoiding anyway the risk of tears and/or lacerations of the fabric when it is coupled to the padding, lies in forming the covering fabric, before application thereof to the padding, by a heat pressing operation with application of steam. A method of this type is disclosed in FR-A-2.347.306. If on one hand the simple idea of imparting a determined shape to an unelastic fabric by heat pressing with steam is surely an obvious step for a skilled man in the art of fabric forming, given that it is the conventional method used, also at home, when forming fabrics of clothes, as well as covering fabrics in general, on the other hand, it must be pointed out that the practical application on industrial scale of this idea is not absolutely easy. Various tests have shown indeed that the above mentioned method, as it is described in FR-A-2.347.306, cannot be used practically in the industry, since it implies a high risk that the steam which is applied during the pressing of the fabric tends at least partially to condense on the fabric itself, giving origin to stains.

The above mentioned problem has been overcome with the method and apparatus forming the subject of Italian patent application No. 67757-A/86 of 6 October, 1986 and in the corresponding U.S. Patent No. 4,844.761. According to this solution, the cover is initially applied to a lower mould which is provided with an apparatus for injecting steam on the cover during pressing. The steam is caused to come to passages formed in the lower mould by being taken from a reservoir of steam under pressure which is remote with respect to said passages and whose body is however able to transfer heat by thermal conduction and by radiation to the wall of the lower mould. In this way, the risk of dew formation and resulting stains on the fabric is reduced at minimum, since the wall of the lower mould is kept efficiently and constantly at high temperature, due to the heat transmission from the body of the steam reservoir to said upper wall. At the same time, a prolonged contact of the steam with the fabric is avoided, since the pressure chamber of the steam reservoir is not in direct communication with the passages formed in said upper wall. After the covering fabric is formed, the latter is applied to the padding of foamed plastic material by gluing with the aid of an adhesive.

Tests have shown that this last known method is very good in order to solve the technical problems which have been disclosed above. However it is not completely satisfactory from the point of view of economy of manufacture, when an automated mass-production is to be prepared. Indeed, when the above described method is to be carried out in a production line, it is necessary to provide, for each padding body to be covered, a relatively complicated lower mould equipment, provided with said devices for injecting steam and the associated reservoir of steam under pressure, which causes very high investments and does not provide for flexibility of production. A further drawback of the method disclosed in U.S. patent 4,844.761 lies in that it does not allow the use of sheets of adhesive material of the so-called "hot-melt" type, in lieu of the conventional adhesive for gluing the cover on the padding body. These sheets must be interposed between the parts to be glued and melt when a predetermined temperature is passed so as to provide gluing. The advantage thereof lies in that they provide a "reversible" gluing, i.e. they
allow at a later stage unglueing of the cover by application of heat. With said known device, the heated steam injection stage is provided during pressing the cover between two moulds, without the padding body being present. Therefore, if a "hot-melt" sheet is applied to the cover at this stage, it would melt over the metal mould which is pressed thereagainst. Therefore, it would be necessary an additional operation for applying the "hot-melt" sheet, following the stage of steam application.

Finally, a further drawback of the method forming the subject of the above identified Italian patent application lies in that it must be necessarily divided in two stages, i.e. a first stage in which the sole cover is formed by heat pressing with injection of steam and a second stage in which the padding body is glued on the previously formed cover.

A method having the features indicated in the pre-characterizing portion of Claim 1 is known from WO-A-92/08601. While this known method enables the use of "hot-melt" sheets, it cannot provide for the injection of steam immediately adjacent to the cover.

An apparatus having the features indicated in the precharacterizing portion of claim 6 is known from WO-A-92/08601.

The object of the present invention is that of keeping all the advantages of the method and apparatus disclosed in U.S. patent No. 4,844,761, while overcoming at the same time all the drawbacks which have been cited above.

In order to achieve this object, the invention provides a method for the manufacture of a padded element, particularly for a motor-vehicle seat, having the features indicated in Claim 1.

Preferably, said cannula means are remote with respect to a reservoir of steam under pressure which is associated with the upper mould, said mould being however in a heat transmission relationship to the reservoir body, so as to avoid the risk of condensation of steam when it first arrives to the initially cold mould after the start of the plant.

A first advantage of the method according to the invention lies in that the steam injection apparatus is associated with the upper mould rather than with the lower mould, as in the case of the above mentioned U.S. patent. This difference gives raise to relevant results from the standpoint of the economy of the plant in the case of a mass-production. Indeed, the lower mould has a greatly simplified structure and may be provided for example also of plastic material. It is then possible to provide a plurality of lower moulds which are caused to advance along a mass-production line, each lower mould being adapted to receive a corresponding cover.

The plant may include a single pressing station, in which there is provided a single upper mould with the steam injection devices associated therewith. The lower moulds with the covers applied thereon are carried in sequence at the upper mould, which is provided at each time with a padding body and then lowered in order to provide the connection to the cover. Said operation cycle may be provided by a line arrangement, or also by a rotating platform arrangement.

A further advantage deriving from the process according to the invention lies in that the steam pressing of the cover and the application of the padding body to the cover are provided simultaneously at a single stage, which increases rapidity of operation and gives the further possibility of adopting hot-melt sheets to provide the reversible glueing of the cover to the padding body.

The above mentioned cannula means provided on the upper mould are preferably made of a plurality of cannulae which are able to pierce the foamed material constituting the padding body so as to provide a gripping action on the latter as well as the following injection of steam adjacent to the fabric.

Another difference with respect to the method disclosed in U.S. patent No. 4,844,761 lies in that the steam arrives at the fabric from its back side, so that the method can be applied also to fabrics, such as velvet, or to skins, which are deteriorated following application of steam by the said known method.

Tests conducted by the applicant have also shown that by injecting steam inside the padding body, immediately adjacent to the cover, a local bulging of the padding body is obtained and a shrinking of the covering fabric, so as to obtain a perfect meeting between cover and padding body at each portion of the latter, also when the shape of the padding body is relatively complicated.

The present invention also provides an apparatus for carrying out the above described method, this apparatus having the features indicated in claim 6. Cannula means are arranged to be inserted through the padding body, so as to hold it on the upper mould, and said cannula means are arranged for connection to a steam reservoir.

As already indicated, the invention also relates to a plant for carrying out the method for a mass-production, which includes a plurality of lower moulds, an upper mould and means for bringing said lower moulds in sequence at said upper mould to provide the above described pressing operation.

Other particular embodiments of the invention are set out in claims 2-5 and 7-9.

Further features and advantages of the invention will become apparent from the following description with reference to the annexed drawings, given purely by way of non-limiting example, in which:

- figure 1 is a diagrammatic cross-sectional view of an apparatus according to the invention in a first operative condition,
- figure 2 is a cross-sectional view of the apparatus of figure 1 in a second operative condition, and
- figure 3 is a diagrammatic view of a gross production plant made according to the present invention.

With reference to figures 1, 2, reference numeral 1 generally designates a covering fabric for a body of
foamed plastic material 2 which is to form the padding of a seat portion of a motor-vehicle seat.

According to the invention, the fabric 1 is initially arranged on a lower mould 3 having a shape corresponding to that of the surface of the padding body 2. The fabric 1 is applied onto the lower mould 3, which has an upper wall 4 having a shape corresponding to that of surface 5 of the padding body 2. The fabric 1 is preferable kept in tight contact with wall 4 by communicating the inner cavity 6 of the lower mould 3 to a vacuum source (not illustrated), by a conduit 7.

The cavity 6 also is communicated to a plurality of holes 8 formed in the wall 4, which enable the cloth 1 to be sucked against the wall 4 when vacuum is applied to chamber 6.

In the illustrated embodiment, the lower mould 3 is made of plastics.

Also according to the invention, above the back side of the cover 1 there is applied an adhesive sheet of the "hot-melt" type 9, which is to provide the reversible gluing of cover 1 onto the padding body 2 simply as a result of the injection of steam.

Reference numeral 10 generally designates an upper mould comprising a plurality of cannulae 11 projecting downwardly and communicated to a first chamber 12 of mould 10. The first chamber 12 can be connected by a conduit 13 and an intercepting valve 14 to a reservoir of steam under pressure 15. Similar to what is disclosed in U.S. patent No. 4.844.761, reservoir 15 is spaced apart from the steam outlet passages (in the present instance cannulae 11) so as to avoid any risk of condensation of the steam. Furthermore, the reservoir 15 is also able to heat the upper wall 10 by thermal conduction and by radiation, so that there is no risk that the steam condenses immediately after the start of the plant as a result of the contact of the steam with cannulae 11, which are initially cold.

Cannulae 11 are provided both to enable the steam to be injected when the padding body 2 is pressed against the cover 1, and to provide a gripping means for the padding 2 which enables this padding 2 to be held on the upper mould 10.

According to the method of the invention, the padding body 2 is then associated initially with the upper mould 10 by introducing cannulae 11 through the foamed plastic material of body 2. The shape of body 2 and cannulae 11 is such that the latter pierce through body 2 and terminates inside such body, adjacent to the outer surface 5. Mould 10 is then lowered onto the lower mould 3 on which there has been previously provided cover 1 with the back side thereof facing upwardly, and, if desired, along with a hot-melt adhesive sheet 9. Cover 1 is thus pressed against padding body 2 and simultaneously valve 14 is opened to enable the passage of steam under pressure from reservoir 15 to chamber 12 and from chamber 12 into cannulae 11. The steam exits from cannulae 11, passes through the foamed material of body 2 and arrives at the hot-melt sheet 9 and cover 1, providing the forming of the cover according to the shape of the padding body 2. In lieu of the hot-melt sheet 9 is obviously possible to provide an adhesive material which is previously distributed on the surface 5 of the padding body 2 or on the back side of cover 1.

When pressing has taken place, the upper mould 10 is raised so as to separate the padding body 2 with the cover 1 applied thereon from the lower mould 3.

Naturally, during this stage, the connection of chamber 6 to the vacuum source is interrupted and, if desired, pressurized air can be pumped into chamber 6 to make the separation of cover 1 from wall 4 of the lower mould 3 easier. Alternatively, the padding body 2 is held on the lower portion 3 by keeping the vacuum within mould 3.

As it is clearly apparent from the foregoing description, in the method according to the invention, the forming operation by steam pressing of the cover 1 is provided simultaneously with the application of the padding body 2. Furthermore, the relatively complicated equipment of the various devices for feeding steam is associated with the upper mould, which enables the lower mould to be made in a relatively simple and economic way. It is thus possible to provide for example a plant of the type illustrated in figure 3 including a rotating platform on which there are provided a plurality of lower moulds 3 each for receiving a cover 1 thereon. The plant includes a single station 16 for application of padding bodies 2 where there is provided the upper mould 10. The lower moulds 3 are brought in sequence under the upper mould 10 of station 16 which is at each time is provided with a new padding body 2. Once each pressing operation has been carried out, the upper mould 10 of station 16 is raised, the padding body 2 with the cover 1 associated therewith is sent towards the exit of the plant and a new padding body is mounted on the upper mould. All said operations may naturally be carried out by automatic and/or programmable devices.

In order to position body 2 on the mould 10, it is preferable to provide a provisional support structure for body 2, having a shape similar to that of mould 3. Once the body 2 has been placed on such structure, the mould 10 is lowered thereon, so that cannulae 11 pierce the body 2, so as to be able to bring it over the mould 3.

As already indicated in the foregoing, since in the method according to the invention the steam arrives at cover 1 from the back side thereof, there is no risk that it ruins the outer surface of the fabric or the skin constituting the cover, also when the fabric is for example constituted by a velvet. Furthermore, the steam injected into the body of foamed plastic material causes a local bulging of the latter which, along with the corresponding shrinking of the fabric originated by the steam wetting, gives raise to a perfect mating between padding body and cover.

Claims

1. Method for manufacture of a padded element, particularly for a motor-vehicle seat, in which a cover
(1) is applied on a padding body (2) and in which the cover (1) is formed according to the shape of the surface (5) of the padding by a pressing operation in a mould (3, 10) and simultaneous injection of a flow of steam,

- wherein the cover (1) is initially applied on a lower mould (3) with the back side thereof facing upwardly, and
- wherein the padding body (2) is pressed against the back side of said cover (1) by lowering onto the lower mould (3) an upper mould (10) on which said padding body (2) has been previously positioned, adhesive means (9) being interposed between said cover (1) and the padding body (2), characterized in that
- simultaneously with the pressing of the padding body (2) against the back side of the cover (1), steam is injected through cannula means (11) projecting downwardly from the upper mould (10), which are arranged through the padding body (2) and terminate inside this body, adjacent to the surface of the latter.

2. Method according to claim 1, characterised in that during said steam injection operation, steam is taken from a reservoir of steam under pressure (15) located remote from said cannula means (11) in such a way however that it enables a heat transmission from the wall of said reservoir (15) to said cannula means (11).

3. Method according to claim 1, characterised in that said cover (1) is kept in tight contact with the lower mould (3) by applying a vacuum.

4. Method according to claim 1, characterised in that said cannula means (11) are arranged to hold said padding body (2) on the upper mould (10) when they are inserted through the padding body (2).

5. Method according to claim 1, characterised in that said adhesive means (9) are constituted by a sheet of the "hot-melt" type to provide a reversible glueing of the cover.

6. Apparatus for use in the manufacture of a padding element, particularly for a motor-vehicle seat, comprising a lower mould (3) and an upper mould (10) to provide forming of a cover (1) according to the shape of a padding body (2) and means for injecting steam in the pressing area during the pressing operation associated with the upper mould (10), characterized in that:

- said means for injecting steam comprise cannula means (11) projecting downwardly from the upper mould (10) and arranged to be inserted through the padding body (10) with the lower outlet ends terminating inside said padding body (2) adjacent to the surface (5) thereof.

7. Apparatus according to claim 6, characterised in that said cannula means (11) are connected to a reservoir of steam under pressure (15) by an intercepting valve (14), said reservoir (15) being remote from said cannula means (11), with an arrangement however which enables heat transmission from the wall of said reservoir (15) to the wall of said cannula means (11).

8. Apparatus according to claim 6, characterised in that the lower mould (3) has an upper wall (4) with holes (8) which can be connected to a vacuum source to suck the cover (1) against said wall (4).

9. Apparatus according to claim 6, characterised in that a line of lower moulds (3) is provided, according to a linear or circular arrangement, a station to apply the padding bodies (2), comprising an upper mould (10), means for bringing the lower moulds (3) in sequence at said station.

**Patentansprüche**

1. Verfahren zum Herstellen eines gepolsterten Elementes, insbesondere für einen Kraftfahrzeugsitz, bei dem ein Bezug (1) auf einen Polsterungskörper (2) aufgebracht wird, und bei dem der Bezug (1) durch einen Pressvorgang in einer Form (3,10) und dadurch zeitgleiche Einsprühungen eines Dampfstroms geformt wird,

- wobei der Bezug (1) zunächst auf eine untere Form (3) aufgebracht wird, wobei die Rückseite desselben nach oben gewandt ist, und
- wobei der Polsterungskörper (2) an die Rückseite des Bezugs (1) gepreßt wird, indem eine obere Form (10), an der der Polsterungskörper (2) zuvor angebracht wurde, auf die untere Form (3) abgesenkt wird, wobei sich Klebmittel (9) zwischen dem Bezug (1) und dem Polsterungskörper (2) befinden,

dadurch gekennzeichnet, daß

- gleichzeitig zu dem Pressen des Polsterungskörpers (2) an die Rückseite des Bezugs (1) Dampf über Kanüleeneinrichtungen (11) eingespritzt wird, die von der oberen Form (10) vorstehen, durch den Polsterungskörper (2) hindurchgeführt werden und im Inneren dieses Körpers an die Oberfläche des letzteren angrenzend zum Halten kommen.
2. Verfahren nach Anspruch 1, **dadurch gekennzeichnet**, daß beim Dampfeinsprühvorgang Dampf aus einem Behälter für unter Druck stehenden Dampf (15) entnommen wird, der von den Kanüleineinrichtungen (11) entfernt angeordnet ist, dies jedoch so, daß Wärmeübertragung von der Wand des Behälters (15) auf die Kanüleineinrichtungen (11) möglich ist.

3. Verfahren nach Anspruch 1, **dadurch gekennzeichnet**, daß der Bezug (1) durch Einwirken eines Vakuums in engem Kontakt mit der unteren Form (3) gehalten wird.

4. Verfahren nach Anspruch 1, **dadurch gekennzeichnet**, daß die Kanüleineinrichtungen (11) so angeordnet sind, daß sie den Polsterungskörper (2) an der oberen Form (10) halten, wenn sie durch den Polsterungskörper (2) hindurch eingeführt werden.

5. Verfahren nach Anspruch 1, **dadurch gekennzeichnet**, daß das Klebemittel (9) durch eine Folie vom "Heißschmelz"-Typ gebildet wird, so daß ein rückgängig zu machtendes Ankleben des Bezugs möglich ist.

6. Vorrichtung zum Einsatz bei der Herstellung eines Polsterungselementes, insbesondere für einen Kraftfahrzeugteile, die eine untere Form (3) und eine obere Form (10) umfaßt, um einen Bezug (1) entsprechend der Form eines Polsterungskörpers (2) zu formen, sowie Einrichtungen zum Einsprühen von Dampf in den Preßbereich während des Preßvorgangs, die mit der oberen Form (10) verbunden sind, **dadurch gekennzeichnet**, daß:

   - die Einrichtungen zum Einsprühen von Dampf Kanüleineinrichtungen (11) umfassen, die von der oberen Form (10) nach unten vorstoßen und durch den Polsterungskörper (10) hindurch eingeführt werden, wobei die unteren Ausläßenden im Innern des Polsterungskörpers (2) an die Oberfläche (5) desselben angrenzend enden.

7. Vorrichtung nach Anspruch 6, **dadurch gekennzeichnet**, daß die Kanüleineinrichtungen (11) über ein Unterbrechungsventil (14) mit einem Behälter für unter Druck stehenden Dampf (15) verbunden sind, wobei der Behälter (15) von den Kanüleineinrichtungen (11) entfernt ist, die Anordnung jedoch so ist, daß Wärmeübertragung von der Wand des Behälters (15) auf die Wand der Kanüleineinrichtungen (11) möglich ist.

8. Vorrichtung nach Anspruch 6, **dadurch gekennzeichnet**, daß die untere Form (3) eine obere Wand (4) mit Löchern (8) aufweist, die mit einer Vakuum- quelle verbunden werden können, um den Bezug (1) an die Wand (4) anzusaugen.

9. Vorrichtung nach Anspruch 6, **dadurch gekennzeichnet**, daß eine Reihe unterer Formen (3) in einer linearen oder einer kreisförmigen Anordnung vorhanden ist, und eine Station zum Aufbringen der Polsterungskörper (2), die eine obere Form (10) und eine Einrichtung umfaßt, mit der die unteren Formen (3) nacheinander zu der Station transportiert werden.

**Revendications**

1. Procédé de fabrication d'un élément rembourré, en particulier destiné à un siège de véhicule à moteur, dans lequel une enveloppe (1) est appliquée sur le corps (2) de rembourrage, et dans lequel l'enveloppe (1) est mise à la configuration de la surface (5) du rembourrage par une opération de pressage dans un moule (3, 10) et par injection simultanée d'un courant de vapeur d'eau,

   - dans lequel l'enveloppe (1) est appliquée initialement sur un moule inférieur (3) avec sa face arrière tournée vers le haut, et
   - dans lequel le corps (2) de rembourrage est repoussé par pression contre la face arrière de l'enveloppe (1) par abaissement sur le moule inférieur (3) d'un moule supérieur (10) sur lequel le corps (2) de rembourrage a été placé au préalable, un dispositif adhésif (9) étant disposé entre l'enveloppe (1) et le corps de rembourrage (2), caractérisé en ce que, simultanément au pressage du corps (2) de rembourrage contre la face arrière de l'enveloppe (1), de la vapeur d'eau est injectée par un dispositif à canules (11) dépassant sous le moule supérieur (10), ce dispositif étant disposé à travers le corps (2) de rembourrage et se terminant dans le corps, près de la surface de celui-ci.

2. Procédé selon la revendication 1, caractérisé en ce que, pendant l'opération d'injection de vapeur d'eau, de la vapeur d'eau est retirée d'un réservoir de vapeur d'eau sous pression (15) placé à distance du dispositif à canules (11) d'une matière telle qu'elle permet la transmission de chaleur de la paroi du réservoir (15) au dispositif à canules (11).

3. Procédé selon la revendication 1, caractérisé en ce que l'enveloppe (1) est maintenue en contact intime avec le moule inférieur (3) par application de vide.

4. Procédé selon la revendication 1, caractérisé en ce que le dispositif à canules (11) est destiné à maintenir le corps (2) de rembourrage sur le moule
supérieur (10) lorsqu'il est introduit dans le corps (2) de rembourrage.

5. Procédé selon la revendication 1, caractérisé en ce que le dispositif adhésif (9) est constitué d'une feuille de type thermofusible, assurant un collage réversible de l'enveloppe.

6. Appareil destiné à être utilisé pour la fabrication d'un élément de rembourrage, notamment destiné à un siège de véhicule à moteur, comprenant un moule inférieur (3) et un moule supérieur (10) destinés à assurer la mise d'une enveloppe (1) à la configuration d'un corps (2) de rembourrage, et un dispositif d'injection de vapeur d'eau dans la région de pressage au cours de l'opération de pressage associée au moule supérieur (10), caractérisé en ce que :

- le dispositif d'injection de vapeur d'eau comprend un dispositif à canules (11) dépassant sous le moule supérieur (10) et destiné à pénétrer dans le corps (2) de rembourrage, les extrémités inférieures de sortie aboutissant à l'intérieur du corps (2) de rembourrage près de la surface (5) de ce corps.

7. Appareil selon la revendication 6, caractérisé en ce que le dispositif à canules (11) est raccordé à un réservoir de vapeur d'eau sous pression (15) par une soupape intermédiaire (14), le réservoir (15) étant placé à distance du dispositif à canules (11), la disposition permettant cependant la transmission de chaleur de la paroi du réservoir (15) à la paroi du dispositif à canules (11).

8. Appareil selon la revendication 6, caractérisé en ce que le moule inférieur (3) possède une paroi supérieure (4) ayant des trous (8) qui peuvent être raccordés à une source de vide pour l'aspiration de l'enveloppe (1) contre ladite paroi (4).

9. Appareil selon la revendication 6, caractérisé en ce qu'il comprend une ligne de moules inférieurs (3), ayant une disposition rectiligne ou circulaire, un poste d'application de corps (2) de rembourrage, comprenant un moule supérieur (10), et un dispositif destiné à placer successivement les moules inférieurs (3) audit poste.