Abstract: A press to be used in a screen printing machine and comprising a rotative pressing roll (11) whose longitudinal axis is mobile in translation, orthogonally to the axis and in parallel to the piece to process, the roll pressing the piece eventually through a flexible cloth (10). The board and the roll are applied directly in the printing stations (22) of the machine, the approach/distancing between the board and the piece (2) being operated by the mechanisms of the machine and the roll being operated by the actuation means of the serigraphic blades. Heat is applied. There is an automatic dispensor of transfer film that comprises a system for automatic ungluing and rolling of the used film.
before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments
"PRESS WITH A PRESSING ROLL AND PROCESS THEREOF"

Technical domain

The present invention relates to a press with a pressing roll, for, *inter alia*, transfer, in particular for use together with automatic screen printing machines, as well as to the process thereof. On the other hand, it also relates to a complementary automatic dispenser of film with the element to transfer or material to transfer, that comprises a system of automatic removal of the used film.

State of the art

Presently, the use of presses for thermal transfer is widespread. Their use is particularly linked to the textile industry, in what concerns the improvement of surfaces for the ulterior application of paints, adhesives or imprints, the transfer of images from any kind of support into the surface to engrave or print, or still the final treatment of a work with the aim of improving the final result.

The functioning of a press of thermal transfer is based on the conjunction of two effects: the one of the temperature, together with the one of the pressure. In the case of the transfer of a compound into a piece being processed, the application of the temperature makes the element to transfer to be in a state adequate to the transfer, making it easier, *inter alia*, the ulterior separation of this
element from the corresponding element of transport; while the pressure promotes the adhesion of the element to transfer to the piece being processed.

1 - Principal types of existing presses

We may divide the presses in two big sets: roll presses and plate presses.

a) Roll presses

They are comprised by a heating zone that makes the pieces to be transferred or pressed to be heated until the desired temperature, these ones being, afterwards, passed through one or more pairs of cylinders that rotate around a fixed axis, in there being applied to them the pressure necessary by means of the said rolls.

These presses, in the case of the textiles, are used only with fabrics processed in continuous, that is, textiles in reel. The fabrics are firstly pre-heated and then they pass in the pair of compressor rolls that promotes the transfer.

Are also know roll presses in other domains besides textile, as, for example, the one described in EP 0183440 A, which is destined to transfer a printed film (named foil) into laminated tube with plastic exterior surface. The laminated tubes are previously pre-heated and, at the time of the film transfer, are made to rotate against a hot roll that, exerting pressure, transfers the pre-printed film into the
laminated tubes, said film being continuously fed, during the transfer, according to the plane of tangency between the laminated tube and the hot roll. This last one has a translation movement perpendicular to the said tangency plane, to allow feeding individually the laminated tubes.

Another example of a transfer press for non-textile applications, where is processed a transfer of a film of material, is described in JP10202742 A. In this case, the application of film is made in pre-printed cards, the film serving merely as protection. A hot roll is combined with a pressing roll, between which pass (in movement) the cards to protect, passing also, in continuous movement, the film.

*Appreciation of some inconvenient s of the roll presses*

The roll presses are not adequate for the transfer of material into a certain type of products. Thus, in the case of a product whose consistency is not sufficient for it to be subject to a push effort (for feeding of the rolls of the press) in the direction of the plane of tangency between the pair of rolls of the press without that product sustaining any wrinkles, the roll presses will only be a viable choice if the product has sufficient length to be put into traction in between the rolls. Well, the textile products are, in general, products without the necessary consistency to be able to be subject to the said effort of tangential compression, fact that determines the non-use, in the textile industry, of roll presses except for long fabrics, namely having various meters.
So, for individual textile articles, such as, for example, t-shirts, or alike, the transfer is made with plate presses.

b) **Plate presses**

They are comprised by two plates: one superior and one inferior. To the superior plate is associated a heating system. The piece and the material to transfer or press are placed in the inferior plate, the superior plate being afterwards placed over the set. Resorting to a system of levers and/or cylinders pneumatic or hydraulic is created a pressure over the said piece which will promote the transfer of the motif to press or the smoothing of the substrate, accordingly to what is intended to press. Are examples of this type of presses, the equipments mentioned in US3979248, US5435883 and US5474633.

Within this set, stand out the presses whose adaptation allows their use together with automatic screen printing machines of the carrousel type. This type of presses allows adding more capacities of automatic processing associated to the automatic screen printing machines.

*Appreciation of the principal inconveniences of the plate presses*

- Problem of the force exerted in the support platform of the pieces.
The main problem resulting from the association, aforementioned, of the plate presses with the automatic screen printing machines of the carrousel type, is related with: (i) the force involved when is generated pressure between the support platform of the piece and the piece and, the case being, the material to transfer or press; and (ii) the strain that said support platform is subject to. In case the force is applied in a non-equilibrated way, it may provoke the deformation of the mentioned support platform, with the consequent decrease of the production quality or, in extreme cases, the destruction of the machine.

To avoid the mentioned inconvenients, one of the possible solutions consists in the structural reinforcement of the screen printing machine and, in particular, of the support platforms of the pieces to process and of the fixation means of such platforms, or in the implementation of systems of adjustment in the machine, so that this one withstands the pressing system. However, the introduction of reinforcements and supplementary systems, besides implicating an increase of cost and complexity, normally originates an increase of the inertia mass of the equipment, and so it presupposes the decrease of the performance of the machine or, alternatively, imposes a reinforcement of the respective actuation means and, therefore, of other structural components, with the correspondent increase of the supplementary cost.

Alternative solutions for the problem are presented in the patent application CA2465762 A1 (AU200420113 A1)
and in the patent US5970874. In these cases, the plate press is, itself, provided with means destined to sustain the support platform of the pieces to process. These presses are of complex construction, inter alia, having their own support structure, completely autonomous, that is, a structure that supports the press directly from the ground, supporting equally the said complementary means of sustaining of the support platform of the pieces to process.

- Problem of the removal of the transfer film ('foil')

For the purposes of this description and enclosed claims, by "foil" is understood a transfer film, inter alia a double-layer film (comprising inter alia polymeric materials) where a layer functions as transporting element and the other is comprised by the element that is destined to be transferred into the pre-defined zones of the piece to process, this one from now on being named transfer element.

One of the typical problems of the state of the art appears in the application of foil, more particularly at the moment of removal of the respective transporting element, which must be executed so that the force applied is distributed throughout a single line (4), perpendicular to the direction of removal, and never over an area, under penalty of damaging the product. In figure 1 may be observed the removal of the so-called used foil (5), that is, of the transporting element with the transfer element.
correspondent to the part non coinciding with the pre-defined zone for the fixation of this last one, zone where, in the piece (2), is visualised the transfer element already applied (3).

The difficulty in guaranteeing the absence of problems in the automation of the application of foil and of the removal of used foil causes that, in practise, that is, in general, made manually.

In fact, in the plate presses, at the moment of the transfer in itself - contrarily to what happens with the roll presses used in the transfer of foil - both the foil and the article to process are static and the ungluing of the support of the foil is not processed in continuous in simultaneous with the transfer, which afterwards makes very difficult the automation of the ungluing.

• **Problem of the energy consumption**

In the current presses, the heating plate needs to be constantly at the application temperature of the foil, bearing in mind that the thermal inertia of the materials used is relatively high. This originates high thermal losses, a high strain on the materials and a big consumption of energy.

• **Problem of the size**

In the cited documents US5970874 and CA2465762 Al, both presses are supported in their own structures and
are applied in a peripheral way to the automatic printing machine. The presses of this type are very voluminous, creating problems of encumbering - even when they are out of service, to the part of the screen printing machine - and, when they are associated to a given station of an automatic screen printing machine, create huge difficulties to the visualisation of the processing under way of the pieces that pass through the station in question, which is detrimental to quality control and, in case of problems, increases the number of deficient pieces. On the other hand, such systems are rather limited in what concerns the optimisation of the pressing area.

For all the stated, it is verified that there is interest in having a press in which are minimised, among others, the problems of the feeding of the piece to process, of the forces exerted in the support platform of such piece; of the high energy consumption and of the encumbering; as well as the problems of the removal of the foil.

**Objectives**

It is an objective of this invention to reduce the space occupied by the current equipments thus facilitating the access to the system without overlooking the security, to offer a more simple device not being necessary a full structure of support, from the ground, for the creation of the necessary counter-pressure, and to optimise the area and the time of pressing, as well as the energy consumption. Additionally, is also intended that the press according to the invention offers the possibility of automatic transfer of n foils. Other objectives will become
apparent from the reading of this description.

**Description of the invention**

The aimed simplification of the device and suppression of the counter-pressure structure with support from the ground, were achieved, in general, by the elimination of the traditional system of plates, responsible for the need to create a high counter-pressure of support of the support platforms of the pieces to process and consequently to provide a firm support from the ground up.

Thus, it was maintained the support platform of the piece (a part composing the screen printing machine) as support plate, but was suppressed the traditional tilting rigid (superior) thermal plate. This one was substituted by a rotative compressor roll whose longitudinal axis is mobile in translation according to a direction substantially orthogonal to the said axis and parallel to the surface of the said support plate.

According to an embodiment of the invention the said compressor roll is a hot roll.

According to an embodiment complementary or alternative to the one of the previous paragraph, in parallel to the said compressor roll there is one or more heating lamps or one or more electrical resistances, that translate together with the said roll.

According to another embodiment complementary or alternative to the ones of the two previous paragraphs,
between the said-compressor roll and the piece to process there is a flexible cloth stretched in a support board for it, parallel to the plane defined by the said axis of the compressor roll and by this one's translation movement.

According to an embodiment complementary to the one of the previous paragraph the mentioned flexible cloth is a thermal cloth.

Since the pressing roll exerts, through the said flexible cloth (when it is present), a pressure rather localised over the piece to process - pressure that is distributed by a small and narrow area that develops substantially around the generatrix line of the roll correspondent to the radius that, at each moment, points orthogonally to the support platform of the said piece - the resulting instantaneous force is small and, therefore, it is also small the effort that the support platform of the piece is subject to, thus, waiving the support of autonomous counter-pressure from the ground up.

Likewise, the resulting force, at each moment, on the compressor roll is identically small.

Besides, the support board of the cloth, due to the flexibility of the cloth, practically is not subject to any supplementary effort when pressure is applied over the piece to process, by means of the roll.

Thus, both the roll and the board are applied directly on the heads of the stations of the conventional screen printing machines, as if it was a mere serigraphic board with its traditional blades, the support board of the cloth
corresponding to the serigraphic board and the roll to the blades.

From all the exposed, there is no need to have any additional supporting structure to promote the counter-pressure support to the support platform of the pieces and, as there is no superior plate, but only the compressor roll and, eventually, the respective flexible cloth, the structure is limited, essentially, to elements similar - as to the effort involved - to the existent in the printing stations of a conventional screen printing machine. In the case of existence of flexible cloth the respective support board corresponds to the board of the serigraphic screen and is directly applied at the printing stations of a screen printing machine in a conventional way.

According to a preferential embodiment of the invention, the said translation movement of the compressor roll is promoted by the conventional mechanisms that, at the printing head of the screen printing machine, actuate the traditional serigraphic blades of a common serigraphic board. The translation speed of the roll may be controlled by conventional means.

Besides, the movement of approach/distancing between such roll - along with, in case it is present, the respective flexible cloth - and the piece to process is promoted exclusively by the conventional means that, in a conventional screen printing machine, are responsible for the approach/distancing between the printing head and the support platform of the piece to process.

After the movement of relative approach between the
printing station provided with the press according to the invention and the support platform of the piece to process, the compressor roll presses the piece to be pressed, to activate or to sustain the transfer or other related process typical of the art, either directly, or through the referred flexible cloth. In parallel, is promoted a transfer of heat into the piece to process and into the foil, in case this one is present, what happens when the operation to be made is what is traditionally known as transfer (of material). The piece (and the foil) being at the desired temperature, the intended pressure is applied through the cited compressor roll. The support platform provides, on its own, the necessary counter-pressure. Afterwards, is promoted the relative distancing between the cloth and the piece already processed, removing, the case being, the used foil, by a manual or automatic process.

As results from the exposed, the press according to the invention profits, for its functioning, from a series of already existent elements in the automatic screen printing machines, and thus it is of very simplified conception.

According to an embodiment of the invention, the thermal flexible cloth is inflatable.

In this case, the process according to the invention presents, besides the phases indicated two paragraphs above, a preliminary phase of inflation of the cloth, with which is obtained, inter alia, the stretching of the foil.

According to a preferential embodiment of the invention, the press is provided with an automatic dispenser of transfer film. Such a dispenser, after the application of
the transfer by the compressor roll, also promotes the removal of the used foil, including the respective ungluing of the piece.

For that effect the dispenser is provided with rolling/unrolling means of used foil; with means of feeding of new foil for pressing; as well as with intermediate tensioning means of new foil and of used foil; means that are combined with specific means for ungluing of the used foil fixed to the piece immediately after the pressing.

According to a preferential embodiment of the invention, the specific means for ungluing the used foil comprise compressed air nozzles that inject compressed air in parallel with the platform.

According to other particular embodiments of the invention, the said specific means for ungluing the used film comprise either wires made to translate in parallel with the platform by means of a system of wires and pulleys, or a rod made to translate in parallel with the platform by means of a pneumatic or electric system.

Obviously, the application of the foil may also be made with the press according to the invention, without resorting to the automatic dispenser of film, the placement of foil and the removal of the used foil being made in a manual way. In this case, the small encumbering of the press, as well as its configuration, allow an easy visualisation and an easy frontal access to the support platform of the pieces to process, which constitutes also an additional advantage of this press, even if it is not complemented with the automatic dispensed of foil.
The invention also respects to the pressing process in which there is a first stage of relative approach between a piece and a compressor roll, until the said compressor roll exerts a compression effort over the said piece, effort eventually made with a flexible cloth and/or an element for transfer of material in an in-between position between the said roll and piece; a second stage of application of localised pressure on the piece immobilised on a support, localised pressure that sweeps the said piece - and eventually the said cloth and/or the said transfer element - as a result of the translation of the mentioned roll according to a direction orthogonal to the axis of the said roll and parallel to the mentioned support that maintains the piece immobilised; and a third stage of relative distancing between the roll and the piece (already processed).

According to a preferential embodiment of the said pressing process the mentioned application of pressure is combined with the heating of the piece to process and, if there is one, of the transfer element (foil).

**Description of the drawings**

Besides figure 1 already cited previously, which represents schematically the operation of the manual removal - according to the state of the art - of the used foil, are presented hereafter, as mere non limitative examples, drawings illustrating the device and the process according to the invention.

Such drawings are based on one or more of the indicated
embodiments, but do not intend to be exhaustive. They refer to the support board of the cloth or press board, to the application of this one to a normal printing station, to the flexible (eventually thermal) cloth, to the application of foil and to the removal of the used foil, to the system of inflation and to their principles of operation.

The figures 2 to 9 show the following:

- the figure 2, represents, in perspective, a roll press according to the invention, with the respective press board and remaining parts, including the optional dispenser of foil (without the respective command, eliminate for graphic simplification);

- the figure 3 exemplifies, in a side view, the application of the press board on a normal printing station, with the limit switches for determination of the path to be undergone by the pressing roll (or compressor roll), as well as the fixation system of the press board to the printing station;

- the figure 4 represents schematically, in perspective, the inflation system of the flexible thermal cloth and the respective heating area;

- the figure 5 corresponds to the figure 4, but illustrates, additionally, the narrow influence area of the pressure that the mobile roll exerts over the support platform of the piece in a given moment of the translation movement of the roll over the cloth;
- the figure 6 schemes, in a sequence of frontal views (a-f), the application of foil and the removal of used foil based on the embodiment that resorts to a blow system;

- the figure 7, exemplifies, in a sequence of side views (a-c), the operation of the system of inflation of the thermal cloth together with the pressing roll, as well as the maximum course that is possible to obtain with the said roll;

- the figure 8 corresponds to the figure 7, allowing to visualise with a bigger detail the pouch of air created in the heating cloth and the effect of the pressure exerted by the roll over it;

- the figure 9 corresponds to the figure 2, in reversed position, allowing to visualise the path of the foil in the respective automatic dispenser (the compressor roll and some parts having been removed for better visualisation);

- the figure 10 corresponds to the figure 9 rotated 90° in the case of the use of a simple flexible (non thermal) cloth together with a compressor roll provided laterally with heating elements;

- the figure 11 corresponds to the perspective view of the set defined by the compressor roll, by the heating elements and by the respective cover, separately;
- the figure 12 corresponds to a bottom perspective view of the set referred to in the explanation of figure 11.

Detailed description of the invention

Hereafter is made a detailed description of the present invention, based on the cited figures, where the elements there expressly referred are:

1 - support platform of the piece to process
2 - piece to imprint or, generically, to provide with a transfer
3 - imprinted or, generically, transferred area
4 - line of force, for removal of foil
5 - foil sheet
6 - supports for fixation of the press board to the head of the station of the screen printing machine
7 - auxiliary roll for the delivering of new foil
8 - auxiliary roll for the delivering of new foil
9 - rolls for the delivering of new foil
10 - flexible (eventually thermal and inflatable) cloth
11 - pressing roll
12 - press board or board of support of the flexible cloth
13 - auxiliary roll for the used foil
14 - auxiliary roll for the used foil
15 - auxiliary roll for the used foil
16 - roll for the rolling/unrolling of the used foil
17 - support structure of the support platform of the piece to process
18 - elements for the fixation of the board on the station
19 - support of the pressing roll isolated
20 - actuator
21 - limit switches
22 - printing station
24 - hot area of the heating cloth
25 - area swept by the pressing roll
27 - compressed air nozzles
30 - limit (maximum) of the course of the pressing roll
31 - cover for isolation of the set compressor roll and heating elements
32 - support of the said set
33 - tubes for cabling
34 - heating elements (resistances or lamps)

According to the invention, the press in question, does not need a specific support structure supported directly on the ground and external to the screen printing machine, being rather a component (easily removable) comprised in an automatic carrousel screen printing machine, to which the press board (12) is directly coupled, in one of the heads of the stations of such machine (see the figure 3). In fact, the press board (12) is placed at a normal printing station (22) without the use of any extra fixation equipment. Using only the fixation elements (18) is possible to fix the press board by its supports (6) to the station (see figures 2 and 3).
As results apparent, there is the possibility of, in case of need, place in a screen printing machine as many press boards as the ones intended, successively disposed ones after the others or in-between with classic printing stations, depending, obviously, on the number of available printing stations.

The operation of the transfer press according to the invention, as well as the respective transfer process, is made accordingly to what is described hereafter.

Firstly is described the case of the transfer without resorting to the automatic feeder of foil and considering the case of an inflatable flexible thermal cloth.

As in a normal printing station, the piece and the material to transfer or press are placed over a support platform (1) of the piece to process (2). The mentioned support platform of the piece to process is placed under the printing station where, instead of a normal printing head, is mounted the press according to the invention (figures 2, 3 and 7a). The printing station is lowered, as usually, the flexible thermal cloth (10), supported by the press board, being then in contact with the mentioned piece and foil (figure 7c). At this stage, there is a transfer of heat from the cloth (10) to the foil (5) and to the piece (2).

The pressing roll (11) is then passed through, one or more times, over the zone to press, stepping the cloth that, in turn, by making pressure over the foil, transfers the correspondent motif into the fabric. The printing station is raised and the support platform (1) of the piece to
process (2) goes on into the next station.

All this happens without resorting to any reinforcement of the structure (17) of the support platform (1) of the piece to process or to other support or backing structure standing directly on the ground to exert counter-pressure in such platform, the later being the solution adopted in AU2004201133A1 and in US5970874A1.

That was only made possible by the reduction of the resultant total effort applied in the platform at any moment, for which the system was 'divided in two parts.

The first is destined to substitute the traditional heat source necessary to the partial liquefaction of the transfer element, source that is normally associated to the superior plate of a conventional rigid plate press. This was achieved through a flexible heating cloth that may be inflated for a homogeneous distribution of the pressure and for a better fixation of the piece to process, as will be described hereafter.

The second concerns the pressure system adopted in substitution to the conventional one of two rigid plates. According to the invention (see figures 2 and 3), the inferior plate is the support platform itself of the piece to process, over which is placed the article or piece, but the superior plate for application of pressure is substituted by a rotative roll (11) with a support (19) backed by a system of actuators (20) already existent in the printing station (for regulation of the pressure of support of the blades), this roll being made to translate preferentially by an hydraulic or pneumatic element also
already existent at a conventional printing station (for operation of the blades), translation whose course is defined by two limit switches (21) also already existent at a normal printing station (for regulation of the course of the blades).

As is schematically visualised in the figures 5 and 8c, the roll creates a narrow influence zone over the flexible cloth. That influence zone (figure 8c) has a projection, in plan view (figure 5), that corresponds substantially to the area given by the product of the length (d2) of the roll (11) by the chord (d3) defined between the two limit points of the intersection arc between the surface of the said pressing roll and the flexible cloth (10) (figure 8c). In the case in which the cloth is not inflatable the chord is more directly influenced by the resilience of the roll and/or of the piece to process itself.

Considering a press of rectangular rigid plates with a given area d2xd1 it is verified that the application of a compression correspondent to a total resulting force F will produce at each point of influence of the plates a maximum pressure \( p = F / (d2xd1) \). To the contrary, in a press according to the invention, considering a roll with an extension d2 and a radius from which will result (from the interaction with the flexible cloth and the piece) a chord d3, it is verified that to obtain the same pressure p at the piece to process is enough that the total resulting force be \( F_i = F \times d3/d1 \). As d3 is only a small fraction of d1 (figure 5) it is verified that the effort \( F_i \) at each moment is much lesser at the device according to the invention. Thus, the supplementary means of support or reinforcement of the support platform of the piece are not needed. It is
therefore possible to apply the pressure directly over the conventional support platforms (of the pieces) of the screen printing machines, as if it was a normal printing.

According to the invention, the regulation of the pressure over the cloth may either be made through the use of rolls with distinct diameters (thus varying \(d_3\)), or it may be made by means of the variation of the total force applied \(F_i\). In this last case, are preferentially used the conventional devices with which the printing stations are usually provided to regulate the pressure of contact of the serigraphic blades.

As at each moment the area of influence of the pressing roll \(\text{(11)}\) is only \(d_2x d_3\) it becomes necessary to make the pressing roll translate so that during that translation the roll (which preferentially rotates freely) and its area of influence go through all the area to process \(\text{(3)}\) of the piece \(\text{(2)}\) . The pressing time is optimised adjusting the limit switches \(\text{(21)}\) so that the area swept \(\text{(25)}\) by the pressing roll is limited to encompass the zone to process \(\text{(3)}\) of the piece \(\text{(2)}\) . In other words: the course \(\text{(30)}\) of the pressing roll is adjusted so that this one is limited to exert pressure over the relevant zone of the piece to process \(\text{(2)}\) .

According to a particular embodiment represented in the figures 7 and 8, the flexible cloth is a thermal and inflatable cloth.

The pillow-like inflation system guarantees the positioning and prevents the creation of wrinkles and creases during the pressing process.
As may be observed in the figure 8 (where, for graphic simplification, was not represented the foil, nor, in the figures b and c, the piece to process, embedded in the inflated cloth), the inflatable cloth is laid down primarily with the centre (figure 8a), defining immediately the position of the motif to transfer from the foil. Afterwards, (figure 8b), all the rest of the motif is stretched and maintained, as the pillow created by the heating cloth (10) is imposed to the piece and to the material to transfer (or to press, etc.). At this stage, the laying down of the cloth is made progressively from the centre outwards radially. At the end of the laying down the roll is then made to translate over the zone to process (figure 8c). The figure 7 (where, for graphic simplification, the pressing roll and the respective limit switches are only represented in the figure 7a) allows also to visualise these operations and, in particular, the stretching of the foil (figure 7b).

The flexible cloth, when it is a thermal cloth, is preferentially inflatable, being a sandwich cloth comprised of by three layers of material. The superior layer is comprised of PTFE (polytetrafluoroethylene), the middle one is a fast heating cloth and the inferior layer is of PTFE. Between the superior layer and the middle one is connected a pneumatic connector for the entrance or exit of the air. This set is adjusted to a rectangular structure (denominated press board) with the help of supports.

The inflatable heating cloth fixed to the board, has at least one temperature sensor incorporated, to enable the control of the said temperature and maintain the
temperature at the intended intervals. That control is made by conventional electronic means.

As the cloth has a rather small thickness, it has a low thermal inertia, being quicker to reach the desired temperatures than the traditional rigid plate presses, being also easier to keep such temperatures with the cloth.

This fact contributes, to a great extent, to the reduction of the energy consumption, comparatively to what is verified in the said plate presses.

In fact, is avoided the need for the cloth to be always at the temperature necessary for the transfer. Thus, the cloth is maintained at an operation temperature (around 160°C), this one being the operation temperature of the cloth when this is not in contact with the piece to process, which, however, will increase rapidly at the time of the transfer.

According to a preferential embodiment, the cloth has independent heating areas and of temperature control, which contributes to a great extent for the decrease of heating times and wastes of heat, allowing to optimise the area to heat, accordingly to the imprinting and transfer (of material) to make.

The figure 4 allows visualising a schematic representation of a cloth according to the invention, where the cloth's area of fast heating (24), which in general does not coincide with the whole cloth, may correspond to a single heating sector or to the sum of various heating sectors.

A flexible cloth that has revealed adequate is a cloth with
the following response and characteristics: Temperature of operation between 140°C and 180°C, with a decrease of temperature of approximately 10°C after the contact with the piece to process, reheating until the initial temperature, with a tolerance (upwards) of approximately +10°C, in about 10s. The maximum temperature allowed is of about 230°C and the maximum pressure of about 6kgf/cm² [approx. 6x10⁵Pa], the shorter folding radius tolerated being of around 10mm. Cloths of this type are available in the market with 3000 to 4000W of total power, being able to be divided in independent sectors.

Although the description has been made based on an example in which was used an inflatable thermal cloth, it is possible, according to the invention, that the heating be made directly by the compressor roll (using for that effect a heated compressor roll) or that the heating be made by a roll sided by autonomous heating elements, the respective set being involved in a protecting cover, all accordingly to the shown in the figures 10 to 12. Also possible are combinations of one or more of the abovementioned hypothesis. In the case of use, as heating elements, of autonomous elements other than the cloth, it is preferred to use a cloth that is a simple flexible cloth (of PTFE), non inflatable, in order to allow a better transfer of heat into the piece and, there being one, into the foil. At the limit, depending partly on the specific material of the piece to process - including its texture (coefficient of friction), thickness and resilience - there may not be an elastic/flexible cloth, case in which the compressor roll itself may be covered by a layer of PTFE.
Hereafter is described the case of the transfer resorting to the automatic feeder of foil.

Although presently there are already automatic procedures for the placement of the foil in plate presses, this placement traditionally is still made manually, suggesting that the automatic equipments specific for the effect are expensive or inefficient. In the manual process, the sheets of foil are placed over the pieces, one by one, process that is very unpractical, slow and prone to errors.

With the system of automatic feeding of foil or automatic dispensing, according to the invention, was intended to eliminate the human intervention, to reduce the times of production and to increase the efficiency of the transfer.

On the other hand, in the case of the manual application of foil it must also be borne in mind the problem of the manual removal of the used foil, delicate process that, if it is not carried out carefully, may bring damage to the piece.

The dispenser according to the invention comprises, thus, a system for automatic removal of foil. Such system may function in three distinct ways: based on a blade of air, on a system of wires or on a metallic rod.

According to the invention, the feeder may support multiple types of foil, simultaneously (see figures 2 and 9).

Basically, there is a rolling/unrolling roll of used foil (16) that starts by pulling new foil(s) rolled in the loading roll(s) of foil (9). The new foil(s) unroll from
this(ese) roll(s), rolling up in the said rolling roll, as they move forward under the cloth (10) and circulate by a set of tensioning auxiliary rolls - rolls of entrance (7, 8) and rolls of exit (13, 14, 15) - as is visualised in the figure 9 where is represented only a foil rolled in a roll (9), but is easily perceptible that there could be two independent foils less wide, disposed in parallel one to the other, side by side, each one of them rolling up in its roll (9). Once the motif (s) of the foil(s) positioned is (are) in the intended point (s), the rolling up of the roll (16) ceases. The inflatable flexible cloth (10), when inflating, stretches the foil from the centre and radially outwards, helping to eliminate any wrinkles (figure 8a). The movement of the screen printing machine normally responsible for the approach between the printing head and the support platform of the piece, places, in this case, the said cloth (10) in contact with the piece (2) to process (figure 8b and transition of the figure βa to the figure 6b). The transfer of material from the foil(s) into such piece is then made, by action of the pressing roll (11) which is made to translate over the zone to treat (roll which is not represented in the figure 9, for mere graphic simplification), accordingly to the already described above (figure 8c). After the pressing and transfer of the motif (s), is given some slack to the foil(s) and the station (22) is again separated from the support platform of the piece, leaving however the foil(s) glued to the zones where the application of the correspondent element of transfer was processed (figure βc), being then necessary to promote the ungluing between this one and the so-called element of transport of the respective foil. Such ungluing is made by unrolling the foil(s) rolled up in the roll (16) in order to create a
excess slack in those (figure 6d) next to the platform (1). A system of blow that injects compressed air through nozzles (27), uses the slack to create an air pouch that creates a sufficient force to unglue the foil (figure 6e) by an effect analogous to the process described regarding the manual removal. At this stage, alternative ways for removing the foil may be used as, for example, a wire or a metallic rod moving in parallel to the platform (1), in a back and forth path, so that the foil is released (the operation of these may be promoted, respectively, by a system of wires and pulleys or by pneumatic or electric systems). In any of the cases, the mentioned pouch is formed, initially based on the supplementary slack given to the foil, this one being put to traction from the respective crest. Finally (figure βf), the used foil(s) is (are) rolled up by the roll (16) and the quantity of new foil(s) necessary for a new application is released by the rolls (9).

This system of application of foil may be used in any type of plate press, but, by its configuration it is particularly suitable to be used with a transfer press with pressing roll according to the invention, the support board of the flexible cloth of the invention serving simultaneously as support for the automatic dispenser of foil.
1. Press with a supporting plate (1) characterised in that it comprises a compressor rotative roll (11) whose longitudinal axis is mobile in translation according to a direction substantially orthogonal to the said axis and parallel to the surface of the said supporting plate (1).

2. Press according to claim no. 1 characterised in that the said plate is the supporting platform (1), alone, of an automatic screen printing machine of the carousel type and in that the said compressor roll (11) is supported by the support of the printing head, or printing station (22), of the mentioned screen printing machine.

3. Press according to any of the claims nos. 1 and 2 characterised in that the compressor roll is a hot roll.

4. Press according to any of the claims nos. 1 to 3 characterised in that there is one or more heating lamps (34) or one or more heating resistors (34) that translate together with the said compressor roll (11).

5. Press according to any of the claims nos. 1 to 4 characterised in that there is a flexible cloth (10) and a supporting board (12) for that cloth, substantially parallel to the plane defined by the said axis of the compressor roll and by the translation movement of this last one, the cloth being placed between the said roll and the piece to process (2) and
pressed against that piece by the same compressor roll.

6. Press according to the claims nos. 2 and 5 characterised in that the said supporting board (12) for the flexible cloth (10) is fixed at the head of the mentioned automatic screen printing machine as if it were a common serigraphic board.

7. Press according to any one of the claims nos. 5 and 6 characterised in that the flexible cloth (10) is a thermal cloth.

8. Press according to the claim no. 7 characterised in that the flexible cloth (10) is inflatable.

9. Press according to the claim no. 8 characterised in that the flexible thermal cloth (10) is a sandwich cloth comprised by three lawyers, the two exterior ones being in PTFE and the central one a cloth of rapid heating and provided with at least a temperature sensor.

10. Press according to the claim no. 8 characterised in that the cloth has independent heating and temperature control areas.

11. Press according to the claim no. 2 characterised in that the translation movement of the pressing roll (11) is promoted by the conventional mechanisms that, in the printing head, actuate the traditional serigraphic blades of a common serigraphic board.

12. Press according to the claim no. 2 characterised in
that the movement of approach/distancing between the compressor roll (11) and the piece to process (2) is exclusively promoted by the conventional means that, in a screen printing machine, are responsible for the approach/distancing between the printing head and the platform of support of the piece to process.

13. Press according to the claim no. 1 characterised in that comprises an automatic dispenser of transference film (5) provided with:

- means (16) of rolling/unrolling of used film;
- means of feeding (9) new film for pressing;
- intermediate straining means of the new film (7, 8) and of the used film (13, 14, 15);
- specific means (27) for ungluing the used film glued to the piece (2) immediately after the pressing.

14. Press according to the claim no. 13 characterised in that the specific means for ungluing the film used comprise compressed air nozzles (27) that inject compressed air in parallel with the platform (1).

15. Press according to the claim no. 13 characterised in that the specific means for ungluing the used film comprise wires made to translate in parallel with the platform (1) by means of a system of wires and pulleys.

16. Press according to the claim no. 13 characterised in that the specific means for ungluing the used film comprise a rod made to translate in parallel with the platform (1) by means of a pneumatic or electric
system.

17. Pressing process characterised in that it comprises a first stage of relative approach between a piece (2) and a compressor roll (11), until the said compressor roll makes a compression effort over the said piece, this one eventually being covered by a film (5) with a transfer material element; a second stage of application of localised pressure on the piece immobilised on a support (1), the localised pressure sweeping over said piece (2), pressing it down - and, being present said film, also pressing down this film - in result of the translation of the mentioned roll (11) according to a direction orthogonal to the axis of the same roll and parallel to the said support (1) that maintains the piece immobilised; and a third stage of relative distancing between the roll and the piece.

18. Pressing process according to the claim no. 17 characterised in that between the said compressor roll (11) and the said piece (2) there is a flexible cloth (10) the mentioned pressure over the immobilised piece being exerted through this cloth.

19. Pressing process according to any one of the claims nos. 17 and 18, characterised in that during the mentioned second stage there is a heat transfer into the piece, promoted by one or more heating elements constituted by the roll (11) and/or by the cloth (10) and/or by resistors or lamps that accompany the said translation movement of the mentioned roll (11).

20. Process according to the claim no. 19, characterised in
that, when and inflatable cloth is used, there is a preliminary stage of inflation of the cloth and in that, at the stage of relative approach between this one and the piece to process, the centre of the cloth is the first to be laid, the laying progressing, developing radially outward, to the zones around it.

21. Process according to the claim no. 17 characterised in that, besides the stages of pressing in itself, also happen, in a synchronised way with these stages, the following stages regarding the automatic dispensing and removal, respectively, of the transfer film(s), new and used:

- releasing of new film by the rolls (9), by means of the rolling of roll (16) for the used foil, and movement of the new film(s) under the cloth (10) until the presentation to the piece of the new motif (8) to transfer over the intended position (s), by means of circulation of the film(s) through a set of auxiliary straining rolls - rolls of entrance (7, 8) and rolls of exit (13, 14, 15);
- stopping of the rolling of the roll (16) for the used foil;
- eventual inflating of the inflatable flexible cloth (10), with the subsequent stretching of the film(s) from the centre of the cloth and radially outwards, helping to eliminate any wrinkles;
- relative approaching between the flexible cloth (10) and the piece to process (2) disposed in a platform (1), until the said piece and cloth enter in contact;
- transferring material from the film(s) into such
piece, by action of the pressing roll (11) which is made to translate over the zone to treat, limited by the limit switches (21);
- releasing of the used film(s) by means of the said roll (16), for creation of an initial slack that allows the free distancing between the station (22) - bearing the cloth (10) and the respective board (12) - and the said platform of support of the piece;
- separating the cloth (10) from the platform of support of the piece, leaving the film (Cs) glued in the zones where has occurred the application of the correspondent transfer element;
- ungluing between the transfer element already pressed into the piece and the correspondent transport element of the respective film, by means of the creation of a supplementary slack deriving from the additional unrolling of the used film(s) by means of the cited roll (16) and of the creation, next to the platform (1), of a pouch of used film(s) based on that slack, the pouch defining a crest by which the film is put into traction;
- rolling, by the roll (16) for the used film(s), unglued from the piece, until reaching the tension necessary for the beginning of the unrolling of new film(s) from the respective roll(s) (9).

22. Process according to the claim no. 21 characterised in that the formation of the pouch of used film(s), based on the additional slack yielded by the roll (16), and the subsequent ungluing between the film(s) and the piece (2), are promoted by the injection of compressed
air through nozzles (27), according to a direction substantially parallel to the platform (1).

23. Process according to the claim no. 21 characterised in that the formation of the pouch of used film(s), based on the additional slack yielded by the roll (16), and the subsequent ungling between the film(s) and the piece (2), are promoted by wires made to translate in parallel to the platform (1) by means of a system of wires and pulleys.

24. Process according to the claim no. 21 characterised in that the formation of the pouch of the used film(s), based on the additional slack yielded by the roll (16), and the subsequent ungling between the film(s) and the piece (2), are promoted by a rod made to translate in parallel to the platform (1) by means of a pneumatic or electric system.
A. CLASSIFICATION OF SUBJECT MATTER

INV.  B41F16/02

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)
B41F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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<td>A</td>
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D. Further documents are listed in the continuation of Box C

X. See patent family annex

'A' Special categories of cited documents

'A' document defining the general state of the art which is not considered to be of particular relevance

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'X' document of particular relevance, the claimed invention cannot be considered without the document

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'S' document member of the same patent family

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