A high speed automatic wrapping machine to handle delicate products with difficult shapes which are still on hardening phase which machine comprises substantially: a central control unit of the machine; a belt conveyer (1) provided with a plurality of suction cups (5) to carry delicate products (4) from a plodder or from another system for feeding of said products (4) to an inlet station (SE); a first system of conveyers (T1) for said products (4); a first rotating upper structure (R1); a second rotating lower structure (R2); said first and second rotating structures (R1, R2) rotate and support said products (4) and carry mechanical members able to rotate and supporting mechanical members able to partially wrap said products (4) by means of a wrapping material (28); primary bending members (P1); primary thermic welding devices (S5T1) to weld the partial wrapping; wrapping devices (AV) to finish the wrapping of the products (4) by means of said material (28), a second system of conveyers and thermic welding device (S5T2) to finish the welding of the finished wrappings and to carry the packed products (4) to an outlet station (SU) of the machine.
| AT  | Austria      | ES  | Spain       | MG  | Madagascar  |
| AU  | Australia    | FI  | Finland     | ML  | Mali        |
| BB  | Barbados     | FR  | France      | MN  | Mongolia    |
| BE  | Belgium      | GA  | Gabon       | MR  | Mauritania  |
| BF  | Burkina Faso | GB  | United Kingdom | MW | Malawi    |
| BG  | Bulgaria     | GN  | Guinea      | NL  | Netherlands |
| BJ  | Benin        | GR  | Greece      | NO  | Norway      |
| BR  | Brazil       | HU  | Hungary     | PL  | Poland      |
| CA  | Canada       | IT  | Italy       | RO  | Romania     |
| CF  | Central African Republic | JP | Japan      | SD  | Sudan       |
| CG  | Congo        | KP  | Democratic People's Republic | SE | Sweden     |
| CH  | Switzerland  | KR  | Republic of Korea | SN | Senegal    |
| CI  | Côte d'Ivoire| LI  | Liechtenstein | SU | Soviet Union |
| CM  | Cameroon     | LK  | Sri Lanka   | TD  | Chad        |
| CS  | Czechoslovakia| LU | Luxembourg | TG  | Togo        |
| DE  | Germany      | MC  | Monaco      | US  | United States of America |
High-speed automatic machine for wrapping delicate products

The present invention relates to an automatic machine which is able to wrap delicate products such as the soap cakes which are just come out of the plodders. More particularly the invention relates to a machine as above by means of which a wrapping speed of the products may be reached which speed is very higher than the wrapping speed reached by means of the use of the known machines and which is able to avoid the soap cakes from being deformed or abraded.

The invention is not specific for the machines able to wrap the soap cakes, but it regards all the machines able to wrap delicate products which come out of a system or which are stored in an idle station before to be sent to a machine according to the invention. The word "soap cake" will be used below as lexical convenience; it is understood that the soap cake may be replaced by any other product which has similar features of plasticity.

Machines able to wrap soap cakes are known; particularly, wrapping machines are known in which some working members have intermittent motions (below mentioned machines of the firts type); further, wrapping machines are known in which some working members have intermittent motions and others working members have continuous motions (below mentioned machines of the second type); at last wrapping machines are known in which the working members have only continuous motions (below mentioned machines of the third type).

The wrapping machines of the first type are not able to have a very high wrapping speed because of the sudden accelerations to which the product is subjected which the same machines have to wrap.

One of the machines of the first type includes several mechanical members such as lateral or longitudinal pushers and elevators which co-operate with the pushers to allow the products to be sent to the carriers or to the packaging means in the machine. The accelerations transmitted by the mechanical members tend to damage the products as much as the acceleration is high. To avoid the product from being damaged the wrapping speed
has to be maintained at a fairly low value to control quantitatively and qualitatively the impacts between the mechanical members and a delicate product.

The wrapping machines of the second type have limitations due to the fact that they are not able to solve the technical problems stated below. In one of these machines the members which have intermittent motions are generally placed between the plodder and the wrapping structure of the machine in which the wrapping process of the soap cakes occurs. Necessarily, the soap cakes in said wrapping structure have a motion which is timed with the motion of the various mechanical members which are able to wrap said soap cakes. For that reason, a carrier (conveyor or chain conveyer) has to be placed between the plodder or another system for feeding soap cakes and fiducial means have to be in the carrier to time the motion of the soap cakes with the motion of said mechanical members. The intermittent motion of the carrier makes the soap cakes jerk and tends to dent them; further, often the soap cakes coming from the plodder or from said system are placed in a wrong way with respect with the fiducial means of the carrier; the inaccurate positioning of the soap cakes on the carrier makes the soap cakes collide each other and, in extreme cases, activates the safety devices for the stopping of the machine.

Further, the soap cakes are placed between the fiducial means of the carrier and for that reason moves with intermittent motion; once they arrive at the loading station of the wrapping machine stop off (of course with the carrier) to be sent to the wrapping structure of the machine. The change-over of the soap cakes from a stop state to a motion state with the speed specific for the wrapping structure is obtained by means of mechanical members (pushers) which operate the soap cakes in a fraction of a second and which may be the cause of permanent deformations of the same soap cakes.

In the wrapping machines of the third type the product to be wrapped moves at a motion nearly constant and in any case continuously. At the present a wrapping machine of the third type does not solve adequately the problem of how to time the motion of the soap cakes coming from the plodder with them motion of the carriers placed between the loading
station and the wrapping structure of the machine. These carriers are structurally like those which are in the above mentioned wrapping machines, are provided with fiducial means for the right positioning of the soap cakes on the same carries and on the inside of the wrapping structure, but moves continuously.

The phase of passage from the system for feeding soap cakes which are upstream of the carriers to the same carriers is a critical phase of the wrapping process since it occurs between members which have different speeds of translation; for that reason, the right positioning of the soap cakes with respect with the fiducial means may be obtained only if the speed of loading is fairly low; but this care does not avoid the carriers, and more particularly, the fiducial means from being stained with coagulated soap, which is removable with difficulty.

The movements in the machines of the first and of the second type are some chain conveyers ranged in sequence, but having speeds of translation which change suddenly whether as intensity or as direction. The passage from a conveyer to another one may be the cause of damage for a soap cake because of the strong acceleration to which it is subjected.

Further, the chains wear and stretch; in consequence troubles to the timings of the various movements of the machine occur and frequent and expensive maintenances are necessary to maintain serviceable the same machine.

At last, the chain conveyers are able to reach fairly low speeds of translation, whether to decrease the wears or to reduce the noise due to the working.

The invention as claimed is intended to remedy these drawbacks. It solves the problem of how to design a high speed automatic wrapping machine to handle delicate products with difficult shapes which are still on hardening phase by means of which machine the following results are obtained: the whole wrapping cycle is considerably shorter than a corresponding cycle carried out by means of a machine of a know type; the products to by treated by means of the machine according the invention are not damaged; consequently the wrapping cycle has not to be interrupted to
recover and to recycle the damaged products.

The advantages offered by the invention are mainly that the machine suffers very low wears to reduce frequent maintenances and troubles to the timings of the various movements of the machine.

Other features, aims and advantages of a machine according to the invention will be better understood by referring to the enclosed drawings which refers to non-restrictive examples in which:

Fig.1 represents schematically an inlet part for the products into a machine according the present invention;

Fig.2 is a frontal view of a constructive part of a first system of carriers for soap cakes in a first embodiment of said system;

Fig.3 is a lateral view of the system shown in the Fig.2;

Fig.4 is a plan of the system shown in the Fig.2;

Fig.5 is a lateral view of the whole system of carriers;

Fig.6 is a frontal view of a operative part of a machine according the present invention;

Fig.7 is a cutaway view with the planes E-E of the part of the machine shown in the Fig.6;

Fig.8 is a constructive part, in a different scale, of the operative part shown in the Fig.6 with a soap cake in a first position;

Fig.9 is a constructive part, in a different scale, of the operative part shown in the Fig.6 with a soap cake in a second position;

Fig.10 is a constructive part, in a different scale, of the operative part shown in the Fig.6 with a soap cake in a third position;
Fig.11 is a constructive part, in a different scale, of the operative part shown in the Fig.6 with a soap cake in a fourth position;

Fig.12 represents schematically a device able to finish the bending of the wrapping of a soap cake;

Fig.13 represents, in a different scale, a detail of the device shown in the Fig.12;

Fig.14 represents the outlet part for a soap cake from the operative part of a machine according to the invention;

Fig.15 represents a plan of a constructive part of a transport device in the outlet part of the machine;

Fig.16 represents schematically the assembly drawing of the machine according to the invention;

Fig.17 represents a welder for the wrappings of the wrapped soap cakes;

Fig.18 represents a part of said welder;

Fig.19 represents a part of said welder;

Fig.20 represents a constructive part of a wrapping device in the machine which device is provided with control levers shown in a first release position for a soap cake;

Fig.21 represents the part shown in the Fig.20 but with the control levers in a seizing position for a soap cake;

Fig.22 is a frontal view of a first system of carriers for soap cakes in a second embodiment of said system;

Fig.23 is a lateral view of the system shown in the Fig.22.

The figures show a high speed automatic wrapping machine to handle
delicate products with difficult shapes which are still on hardening phase or constructive parts of said machine.

On the whole the machine is shown in the Fig.16. Said machine comprises essentially an inlet station $S_1$, a first system of conveyers $T_1$, a first rotating upper structure $R_1$, a second rotating lower structure $R_2$, said first structure $R_1$ and said second structure $R_2$ being able to rotate in opposite directions of rotation to each other and being held up by a supporting plate, primary bending members $P_1$, primary thermic welding devices $S_{T1}$, wrapping devices $A_Y$ to finish the bending of the products by means of a wrapping material, a second system of conveyers and thermic welding device $S_{T2}$, and an outlet station $S_U$.

As shown in the Fig.1, a belt conveyer 1 is able to carry soap cakes 4 from a plodder or from another system (not shown) for feeding soap cakes to the inlet station $S_1$; the belt conveyer 1 is shut itself up and is provided with members (not shown) for its progress at a constant speed in the direction $G_1$ and its retreating; the belt conveyer 1 is provided with a plurality of suction cups 5 which are in sequence and with known feeding and discharging systems of the vacuum for the suction cups 5.

Each one of the suction cups 5 is able to hold a soap cake 4 and to put it down, by discharging the vacuum in the due position, on the below system of conveyers $T_1$ (in the Fig.1 shown with 2, 6 and 6a), the bearing upper section 2a of which is moved by a roller 2c in the direction of the arrow $G_1$ at a constant speed of translation which is considerably near the speed of translation of the belt conveyer 1 as intensity and as direction. Further, the suction cups 5 hold the soap cakes 4 at a height considerably near the height of the upper plane 2d of the system $T_1$. The soap cakes 4 move softly from the suction cups 5 to the system $T_1$ because of the negligible differences in speed and in height between the belt conveyer 1 and the system $T_1$.

The system $T_1$ translates towards the structures $R_1$ and $R_2$, which are the machine 3 of the Fig.1, at a constant speed $V_1$ to avoid the soap cakes 4 from being made jerk.

We can note in the Fig.1 that the system of conveyers $T_1$ comprises a
central belt 2 able to support the soap cakes 4 and two lateral belts 6 and 6a. The central belt 2 has a smooth supporting upper plane 2d, a transverse size smaller than the size of the soap cake 4 considered in the direction of the translation of the belt 2; further the belt 2 lies in a plane which is little higher than the plane in which the lateral belts 6 and 6a lie.

The belt 2 is shorter than the belts 6 and 6a and does not reach the inlet station \( S_c \) of the machine 3, as shown in the Fig.5.

Driving wheels, not shown, are kinematically connected to the lateral belts 6 and 6a to move the same belts at a constant speed of translation \( V_2 \) which is little higher than \( V_1 \).

Each one of the belts 6 and 6a is provided with fiducial elements 7 which are preferably small blocks of rubber or of another material which is as soft as the rubber to avoid the soap cakes from being damaged (Figs.3 and 4). The fiducial elements 7 are shaped as protuberances of the belts 6 and 6a protruding perpendicularly to the lying plane of the same belts. The fiducial elements 7 are placed in sequence on each one of the belts 6 and 6a at constant distances which are very larger than the longitudinal size \( D_c \) of a soap cake 4 considered in the direction of the translation of the belts; further each one of the fiducial elements 7 of the belt 6 is perfectly aligned with a fiducial element 7 of the belt 6a in the direction \( D_1 \) perpendicular to the direction of the translation \( Q_1 \) of the belts 2, 6 and 6a. Walls 7a of the fiducial elements 7 define housings 7b for the soap cakes 4.

The kinematics of the belts 2, 6 and 6a and of the fiducial elements 7 allows to attain a right last positioning of a soap cake 4 on the system of conveyers \( T_1 \) even if the the initial positioning of the same soap cake is not right.

The right positioning of a soap cake 4 is defined by the walls 7a which contact a side 4a of a soap cake 4 in the length of the belt 2 because of the slipping of the belts 6 and 6a with respect with the belt 2.

The Fig.5 shows how the right positioning of a soap cake 4 is reached. At
the beginning of the length \( L_1 \) of the belt 2 a suction cup 5 releases a soap cake 4 in a first position A of the belt 2; since the speed of translation of the belt 2 towards the machine 3 is little lower than the speed of translation of the belts 6 and 6a and of the fiducial elements 7 in the same direction, even if the soap cake 4 has not a right position on the belt 2 in any case it is reached by two fiducial elements 7 which are, respectively, of the belts 6 and 6a. The two fiducial elements 7 operate the soap cake 4 such as to the walls 7a contact a side 4a; this contact occurs in a second position B as shown in the Fig.5. Since the fiducial elements 7 are timed with the kinematics of the machine 3, also the soap cakes 4 which have reached and crossed the position B are timed with the kinematics of the machine 3.

In the length \( L_2 \) covered by the system of conveyers \( T_1 \) the translation of the soap cake 4 is given in charge only to the belts 6 and 6a. The soap cake 4 is astride between two fiducial elements 7 of the belts 6 and 6a. From the position B external to the machine 3 the soap cake 4 is moved by the belts 6 and 6a in a third position C internal to the machine 3 in which are movements able to receive the soap cake 4 and to operate the wrapping process on the same soap cake 4.

In the inside of the machine 3 are driving wheels 12 for the belts 6 and 6a as shown in the Fig.6.

In the Fig.6 are shown in detail and in a frontal view the rotating upper and lower structures \( R_1 \) and \( R_2 \) of the Fig.16 which structures make the machine 3; in the Fig.7 are shown the rotating upper and lower structures \( R_1 \) and \( R_2 \) in a cutaway view with the planes E-E defined in the Fig.6.

The lower structure \( R_2 \) is a lower wheel 9 integral with a first shaft 14 journeled by a supporting plate 3a and kinematically connected with a motor, not shown, to rotate with the wheel 9. The wheel 9 comprises ten radial guides 16 each one of which is sideways delimited by means of two slide gibbs 16a and 16b. Each one of the guides 16 houses slidably a slide 15 provided with an external end 15a which protrudes from the guide 16 and which holds a pin 26 of a supporting lever member 8. A plane surface 8b turned towards the outside of the wheel 9 delimits a first arm 8a of
the member 8 and is able to sustain a side 4b of a soap cake 4 which has reached the position C.

The radial motions of the slide 15 are defined by a bearing 18 (Fig.7) held at an end of a shaft 17 integral with the slide 15. The bearing 18 is inserted in a first grooved contour 19 which develops in a plate 20 integral with the supporting plate 3a and which is shut itself up. The bearing 18 is mechanically constrained to move in the contour 19 which is shaped to co-operrate with the bearing 18 in order that the external end 15a of the slide 15 moves in a first straight-line trajectory $A_1-A_2$ while the wheel 9 is rotating.

The straight-line trajectory $A_1-A_2$ starts from the position C and lies parallel to the axis $A_8$ of a soap cake 4; said position C being reached by the member 8 in that very instant in which it is reached by a soap cake 4 carried astride between the belts 6 and 6a.

We have to note that the direction and the speed of rotation of the wheel 9 are so chosen, in the trajectory $A_1-A_2$ or at least in the position C, the speed of translation of the end 15a has the same direction and an intensity considerably near the intensity of the speed of translation $V_2$ of the belts 6 and 6a to avoid the soap cake 4 from being suddenly accelerated or impacted while it is moving from the belts 6 and 6a to the surface 8b.

The surface 8b lies parallel to itself while the supporting member 8 is moving with translatory motion the trajectory $A_1-A_2$. For that reason, the lever member 8 is provided with a second arm 8c which supports a shaft 22; at the free end of the shaft 22 is fixed a bearing 23 inserted in a second grooved contour 24 which develops in the plate 20 and which is shut itself up.

The bearing 23 is mechanically constrained to move in the contour 24 which is shaped to co-operrates with the bearing 23 in order that, along the trajectory $A_1-A_2$, the surface 8a is maintained parallel to itself.

The shaft 14 and the pin 26 have axes of symmetry parallel to each other.
and lying each other at such a distance that, while the wheel 9 is rotating, the translatory motion of the member 8 along the trajectory $A_1-A_2$ is a straight-line motion with a nearly constant speed and very near the speed of translation $V_2$ of the belts 6 and 6a; for that reason while the belts 6 and 6a are rotating round the driving wheels 12 a soap cake 4 leans on the surface 8b, the inertial frame of reference of which is nearly identical with the inertial frame of reference of the belts 6 and 6a.

The lower wheel 9 co-operates with a upper wheel 11 (above mentioned also upper structure $R_1$) to wrap the soap cake 4.

The upper wheel 11 is integral with a second shaft 13 journeled by the supporting plate 3a and and kinematically connected with a motor, not shown, to rotate with the wheel 11.

The wheel 11 comprises ten radial guides 3l each one of which is sideways delimited by means of two slide gibs 3la and 3lb. Each one of the guides 3l houses slidably a slide 30 provided with an external end 30a which protrudes from the guide 3l and which holds a pin 29 of a carrying lever member 10.

In the Fig.5 are shown two guides 3l with the relevant slides 30; a first slide 30 is shown in the angular position $P_1$ and a second one is shown in the angular position $P_2$.

A plane surface 10a turned towards the outside of the wheel 11 delimits a first arm 10b of the member 10 and is able to lean pushlessly on a side 4c of the soap cake 4 which is in the position $C$.

The radial motions of the slide 30 are defined by a bearing 34 (Fig.7) held at an end of a shaft 35 integral with the slide 30.

The bearing 34 is inserted in a third grooved contour 32 which develops in a plate 33 integral with the supporting plate 3a and which is shut itself up. The bearing 34 is mechanically constrained to move in the contour 32 which is shaped to co-operate with the bearing 34 in order that the external end 30a of the slide moves in a second straight-line trajectory $F_1-F_2$ while the wheel 11 is rotating.

The straight-line trajectory $F_1-F_2$ starts from the position $C$ and lies
parallel to the axis \( A_s \) of a soap cake 4; said position \( C \) being reached by the member 10 in that very instant in which it is reached by a soap cake 4 carried astride between the belts 6 and 6a.

5 We have to note that the direction and the speed of rotation of the wheel 11 are so chosen that in the trajectory \( F_1-F_2 \) the speed of translation of the end 30a has the same direction and the same intensity of the speed of translation of the corresponding end 15a which moves along the trajectory \( A_1-A_2 \).

10 The surface 10a lies parallel to itself while the carrying member 10 is moving with translatory motion the trajectory \( F_1-F_2 \). For that reason, the lever member 10 is provided with a second arm 10c which supports a shaft 37; at the free end of the shaft 37 is fixed a bearing 36 inserted in a fourth grooved contour 38 which develops in the plate 33 and which is shut itself up. The bearing 36 is mechanically constrained to move in the contour 38 which is shaped to co-operate with the bearing 36 in order that along the trajectory \( F_1-F_2 \) the surface 10a is maintained parallel to itself.

20 The shaft 13 and the pin 29 have axes of symmetry parallel to each other and lying each other at such a distance that, while the the wheel 11 is rotating, the translatory motion of the member 10 along the trajectory \( F_1-F_2 \) is a straight-line motion with a nearly constant speed and identical with the speed of translation of the member 8 on along the trajectory \( A_1-A_2 \); further, while the belts 6 and 6a are rotating round the driving wheels 12 the surface 10a of the member 10, the inertial frame of reference of which is nearly identical with the inertial frame of reference of the belts 6 and 6a, leans pushlessly on a side \( 4c \) of the soap cakes 4.

30 A third arm 10d of the carrying lever member 10 holds a pin for two pliers 40 and 41 kinematically connected with a known operating movement (not shown) able to move said pliers 40 and 41. While the lever member 10 is lying in the angular position \( P_1 \), the pliers 40 and 41 draw a sheet of wrapping material 28 able to be thermically welded from the end of a belt conveyor 42 and 43 turned towards the lever member 10; the sheet will be used to wrap the soap cake 4 during the following working phases of the machine.
Because of the rotation of the wheel 11 the member 10 moves from the angular position \( P_1 \) to the angular position \( P_2 \); during this angular displacement the known operating movement closes the pliers 40 and 41 to contact the material 28 the surface 10a. When the member 10 is in the position \( P_2 \) which coincides with the position C the material 28 is between the surface 10a and the side 4c of the soap cake 4.

The belt conveyer 42 and 43 is able to let an edge 28a of the material 28 seized by the pliers 40 and 41; for this purpose the belts 42 and 43 move at a constant speed to drive the wrapping material 28 at a speed very near, as intensity and as direction, the tangential speed of the member 10 which is in the position \( P_1 \).

While the upper wheel 11 is rotating in a predetermined angle \( \alpha \) the trajectory \( F_1-F_2 \) covered by the member 10 is parallel to the trajectory \( A_1-A_2 \) covered by the member 8 while the lower wheel 9 is rotating in a predetermined angle \( \beta \). Further, the speed of translation of the member 10 along the trajectory \( F_1-F_2 \) is identical with the speed of translation of the member 8 along the trajectory \( A_1-A_2 \). This is essential for the carriage of a soap cake 4 from the third C to a fourth position D by means of the members 8 and 10.

The surface 8a of the member 8 holds the side 4b of the soap cake 4 and the surface 10a of the member 10 keeps the material 28 in touch with the side 4c of the soap cake 4. The trajectory \( F_1-F_2 \) ends in the position D.

The pressures transmitted from the members 8 and 10 to the soap cake 4 have such an intensity that it is able to not damage the shape of the same soap cake 4 and to assure its carriage with the material 28.

Advantageously, the radial sizes of the wheel 11 are identical with the radial sizes of the wheel 9; further the number of the slides 30 is the same as the number of the slides 15 to avoid the two wheels from being moved at different angular speed and to maintain the timing of the motions of the slides 30 with the timing of the motions of the slides 15 without using device able to check the timing.
The carrying lever member 10 moves with a straight-line motion also along the trajectories $F_3-F_4$ and $F_5-F_6$. Said trajectories are obtained because of the configuration of the contour 32 in which the bearing 34 is constrained. Whether along the third trajectory $F_3-F_4$ or along the fourth trajectory $F_4-F_5$ the surface 10a of the member 10 lies parallel to the direction defined, respectively, by the same trajectories because of the configuration of the contour 36 in which the bearing 36 is constrained.

The supporting lever member 8 and its surface 8a have the function to support cyclically a soap cake 4 along the trajectory $A_1-A_2$. Along the trajectory $A_2-A_1$ these are idle.

In the Fig.8 is shown more in detail as in the above mentioned Figures the behavior of the members 8 and 10 in the position C soon afterwards that the soap cake 4 is leant on the surface 8a coming from the belts 6 and 6a and that the surface 10a has carried the material 28 on the side 4c by co-operating with the pliers 40 and 41.

In the Fig.8 are shown also a first and a second operating levers 48 and 52 to carry the soap cake 4 from the fourth D to the following positions.

The first lever 48 is pivotet on a pin 48N and the second lever 52 is pivotet on a pin 52S, said pins 48N and 52S being integral with the first arm 10b of the member 10. The first lever 48 comprises an arm 48b on the end of which a shimming 48b is glued. Also the second lever 52 comprises an arm 52a on the end of which a shimming 52b is glued; said shimmings being advantageously of a soft material (for instance of feather-rubber).

The first lever 48 is provided with a second arm 49 the end of which supports a pin for a roller 47 able to contact a fifth cam profile 45 which develops along the peripheral contour of the plate 33 and which is shut itself up. The roller 47 is mechanically constrained to move along the profile 45 which is so shaped to co-operate with the roller 47 in order that when the member 10 is in the position C the arm 48a is removed from a side 4d of the soap cake 4 and when the member 10 is in the position D the arm 48a contacts said side 4d.

The second lever 52 is provided with a second arm 51 the end of which supports a pin for a roller 49 inserted in a sixth grooved contour 50.
which develops in the plate 33 and which is shut itself up. The roller 49 is mechanically constrained to move in the contour 50 which is shaped to co-operate with the roller 49 in order that when the member 10 is in the position C the arm 51 is removed from the side 4d of the soap cake 4 and when the member 10 is in the position D the arm 51 contacts said side 4d.

Between the arm 48a and the pin 48N is a pin 48E provided with an elastic articulation which is able to recover the dimensional differences due to the form tolerances of the soap cakes 4 and to maintain the arms 48a and 52a in contact, respectively, with the sides 4a and 4d of the soap cake 4.

When the member 10 is in the position D (Fig.9) the two arms 48a and 52a allow that the member 10 carries the soap cake 4, by gripping the soap cake 4 with the interposed shimmings 48b and 52b.

During the translation of the member 10 from the position C to the position D the plier 41 rotates around a pin 44 and opens under the control of the known operating movement to free the edge 28a of the material 28. Simultaneously the levers 49 and 52 move, as above mentioned, so that these embrace the soap cake 4 and wrap it partially with the material 28; thus when the member 10 is in the position D the soap cake 4 is wrapped on its three sides 4a, 4b and 4d with the material 28 and is held by the arms 48a and 52a with the interposed shimmings 48b and 52b.

While the wheel 9 is still rotating the member 8 ends its trajectory A2–A1 and moves from the position D to the position C to be ready to the carrying of a next soap cake.

Once the member 10 is over the position D it moves with the soap cake 4 along a first circular trajectory C1 because of the configuration of the contour 32 in which the bearing 34 is constrained.

A lever folding 53 is journaled on a pin 53a supported by the plate 3a; advantageously the folding 53 is placed near the circular trajectory C1 and is kinematically connected to an operating device (not shown) able to move the folding 53 from a first position X1 to a second position X2 and vice-versa. The folding 53 has a crooked end 53b which is able to contact
an edge 20b of the wrapping material 28 with a side 4b of the soap cake 4. The operating device moves the folding 53 from the position X₁ to the position X₂ while the member 10 is running the circular trajectory C₁, as it is shown in the Fig.11.

After this operation the sides wrapped by the material 28 are four and namely the sides 4a, 4b, 4c and 4d.

However the edge 28a of the material 28 has to be laid on the edge 28a which is already properly folded on the side 4b. For this purpose the machine according to the invention is provided with a welding bar 54 supported by the plate 3a in one position which allows the welding bar 54 to come in contact with the edge 28a when the member 10, which is running a section of the straight-line trajectory F₃-F₄ defined by the contour 32 and by the bearing 34, is in front of the welding bar 54. More properly the superimposition of the edge 28a on the edge 28b begins at the instant in which the member 10 makes the contact between the edge 28a and the the sharp edge 54a of the bar 54 and is finished while the member 10 is running the section of the trajectory F₃-F₄, which section is in front of the frontal surface 54b of the bar 54.

The material 28 is a material able to be thermically welded; thus, while the edge 28 is sliding on the surface 54b, it is welded on the edge 28b.

Soon after the welding bar 54 and preferably in a section of the straight-line trajectory F₃-F₄ a cooling bar 55 is placed, which cools the welding made by the bar 54 to avoid the welding from being softened. The welding bar 54 has a frontal surface 54a turned towards the upper wheel 11 and lying parallel to the straight-line trajectory F₃-F₄ so that the side 4b wrapped by the edges 28a and 28b slides on the same bar 54 in the course of a time required to cool the welding. Further, in a known way, the bar 54 is connected with a source of a cooling fluid, not shown, to make the thermal exchange to which the cooling is due.

Once the welding is finished the wrapping material 28 wraps the soap cake 4 on the four sides 4a, 4b, 4c and 4d and the edge 28a is welded on the edge 28b. The wrapping material 28 is shaped as a tubular structure 4t the lateral ends of which are still open.
At the end part of the bar 55 ends the straight-line trajectory $F_3-F_4$ to which is radiused a second circular trajectory $C_2$, as it is shown in the Figs.6 and 12. The trajectory $C_2$ is covered by the member 10 because of the configuration of the grooved contour 32 in which the bearing 34 is constrained.

At the end of the trajectory $C_2$ begins the fourth straight-line trajectory $F_4-F_5$, which the member 10 covers because of the configuration of the grooved contour 32 in which the bearing 34 is constrained. The tubular structure 4t is shaped as shown in the Fig.13, in which the member 10 is not shown as the member 10 is under the tubular structure 4t. The wrapping of the soap cake 4 is finished by folding the lateral ends of the tubular structure 4t which is made by by the material 28 partially welded.

The whole welding of the soap cake 4 is obtained by using two swinging lever folders 56 journaled on a shaft 56a which develops in a direction perpendicular to the direction trajectory $F_5-F_6$ and which is connected with a kinematic motion, not shown, able to move the ends 56b of the folders 56 simultaneously from a first position $Y_1$ to a second position $Y_2$ and vice-versa. When two pushers 56c placed at the ends 56 of the lever folders 56 are in the second position $Y_2$ operate on the lateral ends of the wrapping material 28 which are still open to fold towards the inside of the tubular structure 4t two parts of the wrapping material 28. The parts opposite those which were folded by the pushers 56c are folded in the same way by means of two stationary folding sharp edges 57 which are near the upper wheel 11 in a section of the trajectory $F_5-F_6$ and with which the soap cake 4 contacts moving with the member 10.

While the member 10 is still moving along the trajectory $F_5-F_6$ the wrapping of the soap cake 4 is finished by the material 28; for this purpose the stationary folders 57, 58 and 59 are used which were described in the Italian Patent No. 906,563 filed on 22.09.70.

In the last section of the trajectory $F_5-F_6$ the arm 48a of the lever 48, which is before the soap cake 4 in the direction of the motion of the wheel 11, moves in the release position because of the configuration of the contour 45 which operates the roller 47 like a cam to allow the soap
cake 4 to be moved from the member 10 to the second system of conveyers and thermic welding device $S_{12}$.

The configuration of the contour 45 near the last section of the trajectory $F_5-F_6$ compels the roller 47 to move the arm 48a in the release position. While the soap cake 4 is making release by the arm 48a the wrapping material 28 wraps completely the soap cake 4, but it is not welded laterally.

Further the arm 52a of the lever 52 is still in the seizing position for the soap cake 4 because of the configuration of the contour 50 in which the roller 49 is constrained to move. Such position of the arm 52a helps the soap cake 4 to move from the surface 10a of the carrying lever member 10 to a third carrier 60 comprising two lateral belts 60a and 60b. Further, the surface 10a remains parallel to itself also along the last section of the trajectory $F_5-F_6$ to facilitate this transfer.

While the wheel 11 and the slide 30 are rotating the surface 10a is maintained in a horizontal position by the bearing 36 constrained in the grooved contour 38; when the surface 10a is near the inlet of the carrier 60 the arm 52a of the lever 52 compels the soap cake 4 wrapped by the wrapping material 28 to move towards the inlet of the carrier 60 and lets the transverse axis $A_8$ of the soap cake 4 coincide with the straight line which unites the centres of two first driving wheels 62 and 62a while the plane 52c of the arm 52a is still lying in a vertical position because of the action of the roller 49 constrained in the grooved contour 50.

Besides the first driving wheels 62 and 62a two second driving wheels 63 and 63a are provided to move the belts 60a and 60b; the driving wheels 63 and 63a being able to move the belts 60a and 60b at a high speed of translation. As soon as the soap cake 4 is lying in the inlet of the carrier 60 the the belts 60a and 60b move it away from the surface 10a and thus from the movements of the wheel 11.

By means of the Fig.15 is explained the process to which the soap cake 4 is brought when it is out of the wheel 11. This process comprises the welding of the lateral parts of the wrapping material 28 and of the
following cooling of the same welding.

Two plates 64a and 64b operate, respectively, the active sides of the lateral belts 60a and 60b of the carrier 60 which plates extent longitudinally along a very wide of the length of the same belts. The plates 64a and 64b are stressed to lean against the respective belts by elastic means schematically shown as the springs 64c, 64d, 64e e 64f; the surfaces of the plates 64a and 64b which lean against the belts 60a and 60b are not a cause of a measurable friction for the translation of the same belts, but increase the adhesion between the surfaces of the belts 60a and 60b to which two lateral sides of the soap cake are engaged and the same sides.

Near the outlet of the third carrier 60 and in the same direction of its translation the inlet of a fourth conveyor 65 is placed which comprises, among other things, two lateral belts which are, advantageously, very thin metallic elastic belts 65a and 65b; the belts being good heat conductors. The belts 65a and 65b are closed, respectively, between two pairs of driving wheels 67, 68 and 67a, 68a. The inside part of the metallic belts 65a and 65b leans against heating plates 66 on which it slips; the heating plates 66 being electrically heated and being placed whether near the inlet of the conveyor 65 and in its active side or in the reversal part of the belts 65a and 65b.

Successively to the plates 66, but only in the active parts of the metallic belts 65a and 65b, a pair of cooling member 72a and 72b is placed on which the inside part of the belts 65a and 65b leans to slip. The cooling member 72a and 72b are connected with sources of a cooling fluid, not shown, to which the cooling of the just welded parts is due.

The lateral sides wrapped by the material 28 not jet welded are held by the belts 65a and 65b, because of the adhesion, the belts 65a and 65b carrying the soap cake 4 towards the outlet of the the conveyor 65. The heat transfer by the plates 66 to the material 28 welds it; soon after the welded parts are cooled because of the indirect contact with the cooling member 72a and 72b.
In connection with the outlet of the fourth conveyor 65 is the inlet of a fifth carrier 73 which moves the wrapped soap cakes away from the machine.

In the Figs. 17, 18 and 19 the welding bar 54 and the cooling bar 55 are shown more in detail. Said bars are housed in one housing 80 and their frontal surfaces turned towards the soap cake 4 are a exchanging heat surface 54b which operates the edges 28a and 28b of the wrapping material 28 as above stated.

More particularly the Figs. 17, 18 and 19 show a safety device which is able to cool the frontal surface 54b in a fraction of a second if the wheels 9 and 11 stop because of a failure to avoid the material 28 from being destroyed by a superheating. On its frontal surface 55b the heating bar 54 has two notches 81 and 82 which are able to house, respectively, thin metallic strips 83 and 84 stretched between two supporting member, not shown, and having a very low heat capacity to be heated or cooled in a very short time.

The safety device is housed in the housing 80 and is made up of a jack 85 provided with a rod 86 integral with the bar 54 and with a cylinder 87 integral with the wall 88 of the housing 80; the jack 85 is also provided with a first control device connected to a central control unit of the machine which are not shown because they are of a known type. The jack 85 is able to move the bar 54 from a first position $Z_1$ to a second position $Z_2$ and vice-versa; when the jack 85 is in the first position $Z_1$ the surface 54b contacts with the folded edges 28a and 28b to weld them and the strips 83 and 84 are housed in the notches 81 and 82; in the second position $Z_2$ the surface 54b is removed from the edges 28a and 28b and the strips 83 and 84 are not in the notches 81 and 82.

The bar 54 has a large number of internal hollows 89 able to house resistors connected to a current generator, not shown, to heat the body of the bar 54 and the strips 83 and 84 when the same are in the notches 81 and 82.

A hose-pipe 90 for compressed air is connected to an air compressor 91.
and is provided with taps 92 operated by a second control device, not shown, to intercept or to send a flow of cold compressed air to a canalization 93 made in the body of the bar 54. The canalization 93 is connected to discharging orifices 94 able to spray cold air towards the strips 83 and 84.

If the machine is regular running the jack 85 controlled by the first control device maintains the bar 54 in the first position $Z_1$ and the strips 83 and 84 are in the notches 81 and 82 to be heated by the resistors, which heats also the bar 54. Instead, if the machine stops the jack 85 controlled by the first control device moves the bar 54 to the position $Z_2$; simultaneously the taps 92 of the compressed air are opened by the second control device to send a flow of compressed air to the strips 83 and 84 which contact still the edges 28a and 28b to avoid the same edges from being opened.

In the Fig.20 are shown schematically the levers 45 and 52. The pins 48N and 525 of the levers 45 and 52 are in opposition with respect with the arms 48a and 52a of the relevant lever; more particularly the pin 48N is in the part in which the arm 52a is placed and the pin 525 is in the part in which the arm 48a is placed. This placing of the pins 48N and 52S with respect with the arms 48a and 52a allows to be used arms the length of which causes a whole adhesion of the wrapping material 28 on the external surface of the soap cake 4 and avoids the same material 28 from being wrinkled while the levers 48 and 52 are moving from the release position to the seizing position.

This advantage offered by the structural configuration of the levers 48 and 52 will be better understood by referring to the Figs. 20 and 21.

Refering to the Fig.20 we suppose that the wrapping material 28 lies parallel to the supporting plane of the surface 10a on the surface of the soap cake 4 and that the arms 48a and 52a with the interposed shimmings 48b and 52b contact the wrapping material 28, respectively, along segments represented by the points $K_1$ and $K_2$. When the ends of the shimmings 48b and 52b move from the position shown in the Fig.20 to the position shown in the Fig.21, the same shimmings 48b and 52b are brought into contact with the material 28 along segments represented by the points $K_3$
and \( K_4 \) the distance of which from the surface of the soap cake 4 is higher than the distance of the points \( K_1 \) and \( K_2 \) from the same surface.

During the motion of the levers 48 and 52 from the position of the Fig.20 to the position of the Fig.21 a slipping of the shimmings 48b and 52b with respect with the material 28 is occurs which has stretched the material 28 on the surface of the soap cake 4 to maintain the same material 28 adherent to said surface.

Figs.22 and 23 illustrate a second embodiment of the first system of conveyers \( T_1 \). In this embodiment the system of conveyers \( T_1 \) comprises a central belt 2 and and two lateral belts 6 and 6a. The central belt 2 has a transverse size smaller than the size of the soap cake 4 considered in the direction of the translation of the belt 2; further the belt 2 lies in a plane which is little lower than the plane in which the lateral belts 6 and 6a lie on upper surfaces of which the soap cakes 4 lean. The belt 2 is longer than the belts 6 and 6a and reaches the inlet station of the structures \( R_1 \) ed \( R_2 \), as shown in the Fig.23.

Driving wheels, not shown, are kinematically connected to the belt 2 to move the same belt at a constant speed of translation \( V_3 \) which is little higher than \( V_1 \).

The belt 2 is provided with fiducial elements 7 which are preferably small blocks of rubber or of another material which is as soft as the rubber to avoid the soap cakes from being damaged (Figs.3 and 4). The fiducial elements 7 are shaped as protuberances of the belt 2 protruding perpendicularly to the lying plane of the same belt. The fiducial elements 7 are placed in sequence on the belt 2 at constant distances which are very larger than the longitudinal size of a soap cake 4 considered in the direction of the translation of the belt 2.

The kinematics of the belts 2, 6 and 6a and of the fiducial elements 7 allows to attain a right last positioning of a soap cake 4 on the system of conveyers \( T_1 \) even if the the initial positioning of the same soap cake is not right; said soap 4 cake being released by a suction cup 5 on the conveyers \( T_1 \).
The right positioning of a soap cake 4 is defined by the walls 7a which develop in a direction perpendicular to the direction of the translation of the belt 2 and which contact the soap cake 4 in the length of the belts 6 and 6a because of the slipping of the belt 2 with respect with the belts 6 and 6a.

The Fig.5 shows how the right positioning of the soap cakes 4 on the the conveyers T is reached. At the beginning of the length L of the belts 6 and 6a a suction cup 5 releases a soap cake 4 in a first position A; since the speed of translation of the belt 2 towards the machine 3, with the relevant fiducial elements 7, is little higher than the speed of translation of the belts 6 and 6a in the same direction, even if the soap cake 4 has not a right position on the belt 2 in any case it is reached by one of said fiducial elements 7 of the belt 2. The fiducial element 7 operates the soap cake 4 to bring its side 4b into contact with the walls 7a; this contact occurs in a second position B as shown in the Fig.23. Since the fiducial elements 7 are timed with the kinematics of the machine 3, also the soap cakes 4 which have reached and crossed the position B are timed with the kinematics of the machine 3.
1. A high speed automatic wrapping machine to handle delicate products with difficult shapes which are still on hardening phase which comprises substantially: a central control unit of the machine; an inlet station \(S_C\) reached by a belt conveyor \(1\) provided with a plurality of suction cups \(5\) to carry delicate products \(4\) from a plodder or from another system for feeding of said products \(4\) to said inlet station \(S_C\); a first system of conveyors \(T_1\) for said products \(4\); a first rotating upper structure \(R_1\); a second rotating lower structure \(R_2\); said first and second rotating structures \(R_1, R_2\) being held up by a supporting plate \(3a\) to rotate and supporting mechanical members able to wrap partially said products \(4\) by means of a wrapping material \(28\); primary bending members \(P_1\); primary thermic welding devices \(S_T_1\) to weld the partial wrappings; wrapping devices \(A_y\) to finish the wrapping of the products by means of said material \(28\), a second system of conveyors and thermic welding device \(S_T_2\) to finish the welding of the finished wrappings and to carry the packed products \(4\) to an outlet station \(S_U\) of the machine which is characterised in that:

20 said first system of conveyors \(T_1\) comprises three belts \(2, 6, 6a\); a central belt \(2\) having a smooth supporting upper plane \(2d\) which lies at a height considerably near the height at which lies the lower side of a product \(4\) when said product \(4\) is held by one of said suction cups \(5\); said belt \(5\) being moved by means of known members at a constant speed of translation which is considerably near the speed of translation of said belt conveyor \(1\) as intensity and as direction; said supporting plane \(2d\) of said belt \(2\) having a transverse size smaller than the size of said product \(4\) considered in the direction of the translation of said belt \(2\) and lying in a plane which is little higher than the plane in which said belts \(6, 6a\) lie; said belt \(2\) being shorter than said belts \(6, 6a\) and does not reaching said inlet \(C\) of said structures \(R_1, R_2\); said belts \(6, 6a\) being moved by means of known members at a constant speed of translation which is little higher than the speed of translation of said belt \(2\); each one of said belts \(6, 6a\) being provided with fiducial elements \(7\) which are placed in sequence on each one of said belts \(6, 6a\) at constant distances which are very larger than the longitudinal sizes of said products \(4\) considered in the direction of
the translation of said belts (6,6a); said fiducial elements (7) protruding perpendicularly to the lying plane of said belts (6,6a); each one of said fiducial elements (7) of said belt (6) being perfectly aligned with a fiducial element (7) of said belt (6a) in a direction perpendicular to the direction of the translation of said belts (6,6a) to define housings (7b) for said products (4), said housings (7b) being defined by soft walls (7a) of the fiducial elements (7); two aligned fiducial elements (7) being able to operate said product (4) to bring a side (4b) of said product (4) into contact with said walls (7a), the contact occurring in a position (8) which is between said inlet station (S_e) and a position (C) internal to said structures (R_1,R_2); said fiducial elements (7) being timed with the kinematics of said structures (R_1,R_2) to allow the products (4) which have reached and crossed said position (8) are timed with the kinematics of said structures (R_1,R_2);
said first upper structure (R_1) is an upper wheel (11) able to support a plurality of carrying lever members (10); an end of each one of said members (10) which is in the external part of said wheel (11) having a plane surface (10a) delimiting a first arm (10b) of said lever member (10), said surface (10a) being turned towards the outside of said wheel (11) and being able to lean pushlessly on a side (4c) of said products (4) turned towards the inside of said wheel (11) while said product (4) is lying in said position (C); first mechanisms (32,34) being provided to attain each one of said lever members (10) to be moved along three straight-line trajectories (F_1-F_2-F_3-F_4-F_5-F_6) while said wheel (11) is rotating; the first straight-line trajectory (F_1-F_2) being radiused to the second straight-line trajectory (F_3-F_4) by means of a first circular trajectory (C_1) and the second straight-line trajectory (F_3-F_4) being radiused to the third straight-line trajectory (F_5-F_6) by means of a second circular trajectory (C_2); said first trajectory (F_1-F_2) starting from said position (C) and being covered by each one of said members (10) at a nearly constant speed which has the same direction and an intensity considerably near the intensity of the speed of translation of said first system of conveyors (T_1); the second and the third trajectories (F_3-F_4,F_5-F_6) being covered by each one of said members (10) at a nearly constant speed; first mechanical element being provided to maintain said surface (10a) delimiting a first arm (10b) of said lever member (10) parallel to itself while said lever member (10) is covering said
trajectories (F₁-F₂, F₃-F₄, F₅-F₆); pliers means (40, 41) controlled by a
known operating movement being held up by the end of each one of said
members (10) to draw a sheet of said wrapping material (28) from a belt
conveyor (42, 43) by seizing an edge (28a) of said wrapping material (28)
while said member (10) is moving from a first angular position (P₁) to a
second angular position (P₂); pliers means (40, 41) being able to release
said edge (28a) during the translation of said member (10) to said
position (C) to a position (D) in which said trajectory (F₁-F₂) ends;
lever means (48, 52) provided with arms (48a, 52a) being supported by the
arm of said member (10) delimited by said surface (10a) to support said
product (4) and to wrap partially said product (4) by means of said
wrapping material (28) so that when said member (10) is in said position
(D) said product (4) is wrapped on three sides by said wrapping material
(28); said lever means (48, 52) being provided with elastic mechanical
elements (48E) able to to maintain the arm (48a, 52a) in contact with the
sides of said product (4) to recover the dimensional differences due to
the form tollerances of said products (4); said lever means (48, 52) being
shaped to avoid said material (28) from being wrinkled; said lever means
(48, 52) being connected to cam contours (45, 50) to operate said lever
means (48, 52);
said second lower structure (R₂) is a lower wheel (9) able to support a
plurality of supporting lever members (8); each one of said members (8)
having a surface (8b) turned towards the outside of said wheel (9) which
delimites an arm of said member (8) and which is able to receive a
product (4) which has reached said position (C) and to co-operate with
said member (10) to move said product (4) from said position (C) to said
position (D); second mechanisms (18, 19) being provided to attain each one
of said lever members (8) to be moved along a fourth straight-line trajec-
tory (A₁-A₂) while said wheel (9) is rotating; said straight-line trajec-
tory (A₁-A₂) starting from said position (C) and being covered by each
one of said members (8) at a nearly constant speed which is the same of
translation of said member (10) along said trajectory (F₁-F₂); mechanical
element (23, 24) being provided to maintain a surface (8a) parallel to
itself while the respective member (8) is moving along said trajectory
(A₁-A₂); said trajectory (A₁-A₂) being parallel to said trajectory (F₁-
F₂);
said primary bending members (P₁) to bend an edge (28) of said wrapping
material (28) on a fourth side of said product (4) comprise a lever folding (53) journeled on a pin (53a) supported by said plate (3a); said folding (53) being placed near said circular trajectory (C₁); said folding (53) being kinematically connected to an operating device able to move said folding (53) from a first position (X₁) to a second position (X₂) and vice-versa; said folding (53) having a crooked end (53b) which is able to bring into contact an edge (28b) of said wrapping material (28) with a side (4b) of said product (4) which in nor jet wrapped by said wrapping material (28);

said primary thermic welding devices (S₁₁) lie parallel to said second trajectory (F₃-F₄) and comprise a movable safety device provided with a device to send a flow of compressed air to a heating surface (54b) to cool said heating surface (54b) if the machine is stopping; said primary thermic welding devices (S₁₁) comprising a sharp edge (54a) able to bend an edge (28a) of said wrapping material (28) on on a side of said product (4) and to bend said edge (28a) on said edge (28b); a cooling bar (55) being placed soon after said primary thermic welding devices (S₁₁), parallel to said second trajectory (F₃-F₄); said cooling bar (55) being able to cool the welding made by said primary thermic welding devices (S₁₁); after the work of said primary thermic welding devices (S₁₁) and of said bar (55) said material (28) being shaped as a tubular structure (4t) the lateral ends of which are still open;

said wrapping devices (Aᵥ) comprise two swinging lever folders (56) journeled on a shaft (56a) which develops in a direction perpendicular to the direction trajectory (F₅-F₆); said shaft (56a) being connected to a kinematic motion able to move the ends (56b) of the folders (56) simultaneously from a first position (Y₁) to a second position (Y₂) and vice-versa; pushers (56c) placed at the ends (56b) of said lever folders (56) being able to operate the lateral ends of the wrapping material (28) which are still open to fold towards the inside of the tubular structure (4t) two parts of the wrapping material (28) when said ends (56b) are in said second position Y₂; near the upper wheel (11) and more particularly in a portion of said trajectory (F₅-F₆) two stationary folding sharp edges (57) being placed each one of which is provided with a sharp edge able to fold a part of said material (28) opposite those which were folded by the pushers (56c) while the product (4) carried by the member (10) is contacting said sharp edge; two stationary folding sharp edges being
provided to finish the wrapping of the product (4); said second system of conveyors and thermic welding device \( S_{T2} \) are made of a third (60) and a fourth (65) carriers; said third carrier (60) comprising two lateral belts (60a,60b) shut on driving wheels (62a,63a,62b,63b) up; two plates (64a,64b) operating, respectively, the active sides of said lateral belts (60a,60b) which plates (64a,64b) extending longitudinally along a very wide of the length of said belts (60a,60b); said plates (64a,64b) being stressed to lean against the respective belts (60a,60b) by elastic means (64c,64d,64e,64f) to increase the adhesion between the surfaces of said belts (60a,60b) to which two lateral sides of said product (4) are engaged and the same sides; said third carrier (60) being provides with an inlet near of which the contour (45) acts said lever (48) to move said lever (48) in a release position to allow the translation of said products (4) from said member (10) to said carrier (60) and said contour (50) maintains the contact between said arm (52a) of said lever (52) and the side of said product (4) to compel said product (4) to translate to the inlet of said carrier (60); further, said third carrier (60) being provided with an outlet which lies near the inlet of said fourth carrier (65); said fourth carrier (65) comprising two lateral very thin metallic elastic belts (65a,65b) which are good heat conductors and which are closed, respectively, between two pairs of driving wheels (67,68,67a,68a); heating plates (66) being placed whether near the inlet of said carrier (65) and in its active side or in the reversal part of said belts (65a,65b); said plates (66) being able to make move said belts (65a,65b) which slip on said plates (66) and to supply the heat to weld said material (28) which is not jet welded; successively to said plates (66), but only in the active parts of said metallic belts (65a,65b), a pair of cooling member (72a,72b) being placed on which the inside part of said belts (65a,65b) leans to slip; said fourth carrier (65) being provided with an outlet which lies near the inlet of a fifth carrier (73) which moves the wrapped products (4) away from the machine.

2. A high speed automatic wrapping machine as claimed in claim 1, wherein said wheel (11) comprises a first plurality of radial guides (31); a slide (30) being housed slidably in each one of said radial guides (31); said slide (30) being integral with a first end of a shaft (35) the
second end of which holds a bearing (34) which is inserted in a first grooved contour (32); said contour (32) develops in a plate (33) integral with said supporting plate (3a); said contour (32) being shut itself up and beig able to co-operate with said bearing (34) to define the radial motions of said slide (30); the configuration of said contour (32) defining said straight-line trajectories \( F_1 - F_2 - F_3 - F_4 - F_5 - F_6 \) and said circular radiusing trajectories \( (C_1; C_2) \) covered by an end of said slide (30) which end lies in the external part of said whell (11); said whell (9) comprising a second plurality of radial guides (16); a slide (15) being housed slidably in each one of said radial guides (16); said slide (15) being integral with a first end of a shaft (17) the second end of which holds a bearing (18) which is inserted in a second grooved contour (19); said contour (19) develops in a plate (20) integral with said plate (3a); said contour (19) being shut itself up and beig able to co-operate with said bearing (18) to define the radial motions of said slide (15); the configuration of said contour (19) defining said trajectories \( (A_1; A_2; A_2; A_1) \) covered by an end of said slide (15) which end lies in the external part of said whell (9).

3. A high speed automatic wrapping machine as claimed in claims 1 and 2, wherein said end of said slide (30) which is external to said whell (11) supports a pin (29) to journal said first external end to said carrying lever member (10); said member (10) being provided with a first arm delimited by a plane surface (10a) and with a second arm which is integral with a first end of a shaft (37) the second end of which holds a bearing (36); said bearing (36) being inserted in a third grooved contour (38) which develops in said plate (33); said contour (38) being shut itself up and beig able to co-operate with said bearing (36) to maintain said surface (10a) parallel to itself while said first external end is moving along said straight-line trajectories \( F_1 - F_2 - F_3 - F_4 - F_5 - F_6 \); said external end of said slide (15) supporting a pin (26) to journal said second external end to said supporting lever member (8); said member (8) being provided with a first arm delimited by a plane surface (8a) and with a second arm which is integral with a first end of a shaft (22) the second end of which holds a bearing (23); said bearing (23) being inserted in a fourth grooved contour (24) which develops in said plate (33); said contour (24) being shut itself up and beig able to co-operate with
said bearing (23) to maintain said surface (8a) parallel to itself while said second external end is moving along said straight-line trajectory (A₁-A₂).

4. A high speed automatic wrapping machine as claimed in claims 1 and 2, wherein said lever member (48) comprises a second arm (46) the end of which holds a pin for a roller (47) which is able to contact a fifth cam contour (45) which develops along the peripheral contour of said plate (33) and which is shut itself up; said roller (47) being mechanically constrained to move along said contour (45); said contour (45) being so shaped to co-operate with said roller (47) in order that when said member (10) is in said position (C) said arm (48a) is removed from said product (4) and when said member (10) is in said position (D) said arm (48a) seizes said product (4); said seizing position being maintained as far as said member (10) reaches said second system of conveyers and thermic welding device (S₇₂); said lever membr (52) comprising a second arm (51) the end of which holds a pin for a roller (49) which is inserted in a sixth grooved contour (50); said contour (50) developing in said plate (33) and being shut itself up; said roller (49) being mechanically constrained to move along said contour (50); said contour (50) being so shaped to co-operate with said roller (49) in order that when said member (10) is in said position (C) said arm (52a) is removed from said product (4) and when said member (10) is in said position (D) said arm (52a) seizes said product (4) as far as to insert said product (4) in said second system of conveyers and thermic welding device (S₇₂).

5. A high speed automatic wrapping machine as claimed in claim 1, wherein at least one of said lever members (48,52) is provided with a pin (48E); said pin (48E) having an elastic articulation and being between said arm (48a,52a) and a pin (52S,48N).

6. A high speed automatic wrapping machine as claimed in claim 1, wherein said pins (48N,52S) of said levers (48,52) are in opposition with respect with the arms (48a,52a) of the relevant levers (48,52); the pin (48N) being in the part in which the arm (52a) is placed and the pin (52S) being in the part in which the arm (48a) is placed.
7. A high speed automatic wrapping machine as claimed in claim 1 and 2, wherein the number of said radial guides (31) is the same as the number of said radial guides (16); the radial sizes of said wheel (11) being identical with the radial sizes of said wheel (9).

8. A high speed automatic wrapping machine as claimed in claim 1, wherein said safety device of said of said primary thermic welding devices (51) comprises a jack (85) provided with a rod (86) integral with a heating bar (54) and with a plunger (87) integral with a wall (88) of a housing (80); said jack (85) being provided with a first control device connected to a central control unit of the machine; said jack (85) being able to move said bar (54) from a first position (Z1) to a second position (Z2) and vice-versa; when said jack (85) is in said first position (Z1) said surface (54a) contacts the folded edges (28a,28b) to weld said edges (28a,28b); when said jack (85) is in said second position (Z2) said surface (54a) is removed from said edges (28a,28b).

9. A high speed automatic wrapping machine as claimed in claims 1, in which a frontal surface (54b) of said heating bar (54) has notches (81,82) which are able to house, respectively, thin metallic strips (83,84) stretched between two supporting member and having a very low heat capacity to be heated or cooled in a very short time; said strips (83,84) being able to support the product (4) when said bar (54) is in said second position (Z2), wherein said heating bar (54) comprises a canalization (93) made in the body of said bar (54); a first part of said canalization (93) being connected to a hose-pipe (90) for compressed air; a first part of said canalization (93) being connected to discharging orifices (94) able to spray cold air to said strips (83,84); said hose-pipe (90) being connected to an air compressor (90) and being provided with taps (92) operated by a second control device to intercept or to send a flow of cold compressed air to said strips (83,84); the intercepting being operated when said bar (54) is in the position (Z1) and the sending being actuated when said bar (54) is in the position (Z2).
### INTERNATIONAL SEARCH REPORT

**International Application No.** PCT/EP 90/02174

**I. CLASSIFICATION OF SUBJECT MATTER**

According to International Patent Classification (IPC) or to both National Classification and IPC:

IPC5: B 65 B 11/32, 35/24, 51/18; B 65 G 47/31

**II. FIELDS SEARCHED**

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

**III. DOCUMENTS CONSIDERED TO BE RELEVANT**

<table>
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<tr>
<th>Category</th>
<th>Citation of Document, with indication, where appropriate, of the relevant passages</th>
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<td>FR, A, 1398222 (ACMA) 7 May 1965 see page 1, left-hand column, lines 1-10; page 4, left-hand column, lines 19-33; page 4, right-hand column, lines 46-55; page 6, left-hand column, lines 8-21; figures 7A, 9, 12</td>
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<td>A</td>
<td>US, A, 2723516 (MALHIOT) 15 November 1955 see column 18, line 52 - column 20, line 20; figure 1</td>
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<td>A</td>
<td>FR, A, 1030446 (COMP. DE SIGNAUX ET D'ENTREPRISES ELECTRIQUES) 12 June 1953 see page 1, right-hand column, lines 9-39; figure 2</td>
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  * "O" document referring to an oral disclosure, use, exhibition or other means
  * "P" document published prior to the international filing date but later than the priority date claimed

**IV. CERTIFICATION**

Date of the Actual Completion of the International Search: 26th March 1991

Date of Mailing of this International Search Report: 23.04.91

International Searching Authority: EUROPEAN PATENT OFFICE

Signature of Authorized Officer: [Signature]

Form PCT/ISA/210 (second sheet) (January 1985)
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For more details about this annex: see Official Journal of the European Patent Office, No. 12/82.