Fig. 10
A folding method for the formation of folds or corrugations on sheet material, which is preferably folded in the form of a cylindrical sleeve, the corrugations being formed in a single helical path on the sleeve by a pair of fixed forming rollers, while the sleeve is passed between these rollers.

The invention relates to a folding method, namely the formation of folds or corrugations on sheet material, these corrugations having various profiles and the folded sheet being in the form of a flat or other surface and in particular a cylindrical or conical sleeve.

The object of the invention is to provide a new method having multiple applications such as for example the production of the following products:

- Elements forming part of the sandwich-type of panels for aeronautical or space travel (coolings for aircraft engines or connecting skirts for missile stages).
- Large-size expanding bellows (having a diameter of several metres).
- Flexible pipes or conical sleeves of great length obtained by the screwing or fish-plating together of cylindrical or conical elementary sleeves.
- Cylindrical enclosures having fluidtight walls obtained by the appropriate association of corrugated and uncorrugated sleeves assembled in the form of a sandwich structure.

The folding method according to the invention comprises in accordance with the well-known technique diagrammatically shown in FIG. 1, the use of two forming rollers G2, G3 of interengaged or conjugate shapes, namely male and female rollers, between which a thin sheet F of material having characteristics suitable for the formation of a pressing constituted by a fold or corrugation O in the form of a continuous recess which is formed as the rollers are driven in rotation in opposite directions about their fixed axes X1, X2, as shown by the arrows f1, f2 the sheet moving in the direction of arrow f3.

In the part of the sheet located immediately to the rear of the pinching zone P of the rollers, namely above the rollers relative to the direction of motion of the sheet F, a "blister" C is formed immediately before formation of the portion of the corrugation which is about to take shape. This blister is the result of a state of equilibrium, which is created at each relative position of the rollers and the sheet, between the bending created by the rollers in the portion of the sheet inserted therebetween and the internal tensions or stresses in said part of the sheet above the rollers. These tensions are complex and often in unstable equilibrium so that the instantaneous shape and dimensions of the blister C vary constantly in an irregular and unpredictable manner.

It has been discovered by the applicant that this phenomenon of the fluctuating formation of the blister can be utilized for preparing the regular formation of the portion of corrugation on the point of being formed, on condition that the blister is contained within predetermined limits which are fixed relative to the zone P in such manner as to prevent undesirable excessive deformations of the blister. This blister then distributes the material at the moment of formation of the corrugation and by a regulating effect, corrects certain defects, such as the imperfect state of the surface, variations in the mechanical characteristics which might exist in the sheet.

According to one feature of the invention, consequently, there is employed the forming method comprising the passage between forming rollers of conjugate shape, said method constantly ensuring that the blister, which is formed at the end of the corrugation being formed, is held within predetermined limits which are fixed relative to the pinching zone of the rollers.

This restraining action is obtained by pressing means which have rolling or sliding contacts with the sheet, these means being applied with such pressure as to form abutment lines which constantly prevent the blister from extending beyond these lines, the latter being fixed with respect to the pinching zone and above said zone relative to the direction of movement of the sheet.

According to another feature of the invention, in the case where the folding to be carried out comprises a series of evenly-spaced juxtaposed parallel corrugations—which is in practice the most frequent case—each corrugation is utilized as a guide for the formation of the following corrugation.

The corrugations can be formed on a plane sheet or on a cylindrical sleeve. In the latter case, it is advantageous to form a single corrugation in the form of a helix and to start with a sleeve made from a rolled sheet whose ends are butt-welded, a step or offset proportional to the developed length of the profile of the corrugation to be formed being provided between the two ends of the sheet, the first spike of the helix being formed by employing the edge of the sleeve as a guide and the other coils being produced by employing the preceding coils as a guide. The folded or corrugated sleeve can be transformed into a plane folded sheet by cutting the sleeve along the weld line and developing the collar in a plane.

A variant of this method is applicable to the folding of a sleeve comprising at least one section of a conical surface, the folding resulting in the course of this operation in a reduction in the length of the apothem of the frustum of a cone and in an increase in the angle of conicity.

According to the method of this variant, in the course of the folding operation the sleeve is constantly supported by a support and guide means in contact with the surface of the sleeve, and the position and orientation of these means is progressively modified in accordance with the changes in shape, dimension, position and orientation undergone by the sleeve in the course of this folding operation, whereby these means constantly perform their sleeve supporting and guiding functions.

Another object of the invention is to provide a machine for carrying out the method defined hereinafore, said machine comprising at least one pair of forming rollers having conjugate profiles, means for driving said rollers at the same linear speed, supports for carrying and guiding the sheets to be folded, said machine further comprising means for containing the blister which are in sliding or rolling contact with the sheet to be folded (a plane sheet or collar).

Each of the male and female forming rollers can be replaced by a pair of rollers rigidly coupled together, the space between the median planes of the two rollers of this pair being equal to the pitch of the corrugations, one of these rollers being the working roller for forming a corrugation and the other being a self-guiding roller, the corrugation previously formed being inserted between
the two rollers, namely the male roller and the self-guiding female roller.

If the sheet to be folded is a sleeve and the folding comprises a single corrugation in the form of a helix, said pitch of the corrugations is equal to the pitch of the helix.

If the sleeve is frusto-conical, the support and guide means of the sleeve comprise a first series of cylindrical means mounted on a fixed unit and positioned and oriented in such manner as to be constantly in contact with the smooth uncorrugated part of the sleeve along generatrices whose extensions are concurrent at the moving geometric apex of this smooth part, and a second series of cylindrical means mounted on a movable unit and positioned and oriented in such manner as to be constantly in contact with folded part of the sleeve along lines of contact which are concurrent at the moving geometric apex of this folded part.

Another object of the invention is to provide sleeves (this expression being intended to mean plane sheets and sleeves) folded by means of the method and machine defined hereinafter, and a sleeve formed from a smooth rolled sheet whose two ends are welded and offset so as to produce a folded sleeve having a helical corrugation.

Further features and advantages of the invention will be apparent from the ensuing description with reference to the drawings to which the invention is in no way limited.

In the drawings:
FIG. 1 illustrates the known method as mentioned hereinafter;
FIG. 2 is a diagram explaining the self-guiding method constituting one of the features of the invention;
FIG. 3 is a view of a variant of said self-guiding method permitting a progressive folding;
FIG. 4 is a diagrammatic view of a smooth circular sleeve prepared in a special way for carrying out the folding method;
FIG. 5 is a diagrammatic assembly view of one embodiment of the folding machine according to the invention;
FIG. 6 is a diagrammatic view of said machine at 90° to FIG. 5;
FIGS. 7, 8, 9 and 10 are partial diagrammatic detail views of various producing stages showing, in the course of these stages, the positions of the various holding, positioning and containing elements;
FIG. 11 is a partial perspective view of the support means and the means controlling the various maintaining, positioning and containing elements;
FIG. 12 is a diagram corresponding to a longitudinal sectional view of a conical sleeve before and after folding;
FIG. 13 is a diagram of the sleeve in the course of folding;
FIG. 14 is a perspective view of the formation of a corrugation by the machine employed in the case of a frusto-conical sleeve;
FIG. 15 shows by way of example a machine for adapting special holding and guiding supports in the case of a frusto-conical sleeve, and
FIGS. 16 and 17 are longitudinal diagrammatic sections of a bi-concave folded sleeve and a bi-convex folded sleeve respectively.

The machine described hereinafter as one embodiment of the invention and shown in FIGS. 5–11, is a machine for producing cylindrical large-diameter folded sleeves by means of the principle of self-guiding rollers defined hereinafter and forming on the sleeve a single helical spire or corrugation.

The principle of the self-guiding is shown as an example in FIG. 2 which illustrates a couple of forming elements 1 and 2 consisting of two pairs of rollers. The pair 1 comprises two or more male rollers 1a, 1b, rigidly coupled together or formed in one piece; the pair 2 comprises two or more female rollers 2a, 2b rigidly coupled together or in one piece, the profiles of the female rollers being respectively conjugate with those of the rollers 1a, 1b. These two pairs are driven at the same linear speed so as to rotate about their parallel axes X1, X2.

The rollers 1a, 2a form the corrugation in a portion of the large-diameter sleeve V. In the drawing, coil O2 of this corrugation is in the course of formation. The rollers 1b, 2b are guide rollers, the coil O1 being interposed between these rollers and acting as a guide for the path of the corrugation O2. The distance between the planes of the coils (or pitch of the helix) is obviously equal to the distance between the two median planes of the rollers 1a and 1b (or 2a or 2b).

It is clear that the coil O2 will itself act as a guiding coil for the formation of the following coil and so forth.

When it is necessary to form deep corrugations or when these corrugations must be formed on thick sheets, forming elements could be employed which consist of rollers of different diameters, for example the forming elements shown in FIG. 3, each of which comprise three rollers, namely three male rollers 1d, 1e, 1f in one piece or three female rollers 2d, 2e, 2f. The profiles of the pairs of rollers 1d–2d, 1e–2e and 1f–2f have increasing values, the profile of the pair 1f–2f corresponding to the profile of the corrugation to be obtained. In the drawing, the corrugation O3 being formed in the smooth part of the sleeve V, which undergoes a first forming through the pair of rollers 1d–2d, is of shallow depth; the corrugation O4, which is submitted to a second forming operation by the pair of rollers 1e–2e, has a greater depth than the depth of the corrugation O3; the corrugation O5 is formed at normal depth by a third forming stage effected by the pair of rollers 1f–2f; the corrugation O6 was formed in the course of the preceding revolution of the sleeve.

FIG. 4 shows a mounted sleeve 3 prepared for constructing a circular large-diameter corrugated sleeve (for example having a diameter of 2.20 metres). This sleeve 3 consists of a strip of sheet steel 4 having a thickness of 0.1 mm. and of suitable grade corresponding, for example, to the grade Z12CN18/8AFNOR or AISI301 of U.S. standards. This strip is wound in the form of a cylinder and it abutting ends are being aligned along the weld line 5. No special preparation of the strip from the metallurgical or appearance point of view is necessary (variation for example in the surface finish can even exist in different zones of the strip). A step or offset 6 whose length is proportional to the development of the corrugation, is formed on one end of the strip, and after welding, this sleeve is slipped onto a cylindrical support 7 having suitable outside diameter (slightly less than 2.20 mm. in the presently-described embodiment). The width of the smooth sleeve V is selected in accordance with the width to be obtained after folding, bearing in mind the number of corrugations to be formed and the shape and dimensions of the profile of the corrugations. For example, this profile could be a triangle having a pitch of 4 mm. (representing the pitch of the helix to be formed) and a height of 2.5 mm.

The forming machine according to the invention on which the sleeve 3 shown in FIG. 4 is disposed (the smooth sleeve being shown at 4 and the part thereof already folded at 4P), comprises, as shown in FIGS. 5 and 6, a stand 8 carrying a motor speed-reduced unit 9 driving at the same linear speed and in opposite directions two parallel cylinders 10, 11. The lower cylinder 11 is rotatable in a fixed bearing block 12, the upper cylinder 10 is mounted at its left end, as viewed in FIG. 5, on a bearing 13 which is pivotal on the bearing 12 in the direction of arrow 14 so as to permit pivoting the cylinder 10 and separating it from the cylinder 11.

These cylinders carry forming and self-guiding elements, namely: on the cylinder 10, the male rollers 1a, 1b, 1c . . . and on the cylinder 11, the female rollers 2a, 2b, 2c . . . . The two sets of rollers are driven at
the same speed by two gears 14, 15 respectively keyed to the cylinders or shafts 10 and 11 and meshed together.

The pivoting of the cylinder 10 enables a mounted sleeve 3 to be inserted between the two sets of rollers. Guide supports 16a, 16b, 16c, 16d connected to the stand and applied to the periphery of the sleeve, hold the latter in position. These supports are movable so as to be adaptable to the various diameters of the sleeves. For example, in respect of the sleeve 3 shown in dotted line in FIG. 6, these supports could assume the positions shown at 16a to 16d.

Rollers, such as 17a to 17d, are so arranged as to permit the sleeve to be screwed along as the formation of the helical corrugation proceeds on the smooth surface of the sleeve.

The machine further comprises a number of rotary elements (rollers and cylinders) which can be seen in FIGS. 7 to 10.

Some of them are mounted on movable supports shown in FIG. 11.

These elements are the following: Horizontal roller 18a, 18b, 18c (FIG. 7) which are in contact with one of the edges of the sleeve 4.

Horizontal rollers 18d, 18e which are in contact with the other edge of the sleeve.

Rollers 19 and 20a to 20c in contact with the cylindrical surface of the sleeve.

Shafts 21a to 21d provided with shoulder collars 22a to 22d applied under pressure against the whole of the sleeve (the collar 22d is not shown in the drawing but its position is obvious) and keyed to these shafts, are forming rollers 23a to 23d.

Two arms 24a, 24b (FIGS 8 to 11) carrying cylindrical rollers or cylinder 25a, 25b, and forming rollers 26a, 26b.

Horizontal rollers 18a to 18c (FIG. 11) are mounted on forks controlled by slidable mechanisms 27a to 27e which are for example hydraulic jacks. The roller 19 is mounted on a slidable mechanism 28 which is, for example, a hydraulic jack. The rollers 20a to 20c are mounted on pivot forks controlled by slidable mechanisms which can be, for example, jacks 29a to 29b: the shafts 21a to 21d (FIG. 7) are rotative about fixed axes, as is the roller 25d; the roller 25a (FIG. 11) is rotative about its axis, and the arm 24a which carries the roller is pivotable about a horizontal transverse pin (not shown in the drawing) so that it can be raised to the position shown in FIG. 11 or lowered so that the roller 26b is in contact against the roller 26c.

All the hydraulic control mechanisms, or others, are connected to the stand 12 of the machine. They can be controlled by a remote-control unit 30 (FIG. 11) which is so arranged as to control the mechanisms in accordance with given frequencies; for example, as a function of the angular position of the sleeve 4 relative to the stand of the machine.

The pivoting system 13 (FIG. 5) permits raising the cylinder 10 and introducing between the cylinders 10 and 11 the sleeve 4 to be corrugated, which is mounted on the sleeve support 7. The step or offset 6 is so disposed that it is interposed between the forming rollers 1a and 2a.

The detail of the operations is shown in FIGS. 7, 8, 9 and 10.

In FIG. 7 it can be seen that the sleeve is maintained in position by the various rollers. The correct positioning of the step 6 between the forming rollers 1a and 2a is insured by the horizontal rollers 18a, 18b, 18c against which the sleeve 4 bears; the rollers 19 and 20a, 20b, 20c, 20d control the path of movement of the step. The rollers 18d and 18e maintain a constant pressure of the sleeve 4 against rollers 18a, 18b, 18c. Further, the shafts 21a, 21d carrying the shoulder collars 22a to 22d, which are applied under pressure against the whole of the sleeve 4 and its support 7, insure firstly that there is a constant distance between the support 7 and the forming rollers 1a, 2a owing to the shoulder on the collars, and, secondly, in combination with the cylinders 10 and 11, the three points of support necessary for the sleeve in its working zone.

When the cylinders 10 and 11 are unlightened, the sleeve on its support 7 is free to rotate but it is in abutting relation to the rollers 18a to 18c and the support 7 is also in abutting relation to the shoulder collars 22a to 22c.

After the cylinders 10, 11 are tightened and made to rotate, the step 6 automatically places itself between the wheels 1a, 2a.

The cylinders 10, 11 drive the sleeve and this starts the formation of the corrugation in the step 6. As the corrugation is being formed (FIG. 8), the corrugation portion is inserted between the rollers 23a, 23b keyed to the shafts 21a, 21b. The bubble or blister C is created and this requires putting the pivotal roller 25a under pressure on the roller 25b; these rollers 25a and 25b then performing the function of containing elements which maintain the blister and prevent an excessive spreading of the latter. When the corrugation has thus been started, the rollers 18a, 20a (FIG. 7) can be withdrawn as they are now useless owing to the stiffness of the sleeve resulting from the corrugation. This withdrawal of the rollers 18a, 20a is achieved by acting on their jacks 27a, 29a (FIG. 11).

As the sleeve continues its movement of rotation, the corrugation (FIG. 9) is then inserted between the rollers 23c and 23d (the latter is not visible in FIG. 9) respectively mounted on the shafts 21c, 21d and between the rollers 26a, 26b whose position is predetermined. The positioning rollers 18b to 18e, 19, 20a, 20b are no longer needed and are withdrawn.

As the sleeve continues to rotate, the step 6 is inserted between the self-guiding rollers 1b, 2b and thereupon the corrugation is formed in a continuous manner (FIG. 10) by the screwing effect between the rollers 17a, 17b, 17c etc., which was previously arranged for this purpose.

The machine can further comprise accessory mechanical regulating means permitting precise regulations.

The application of the process according to the invention, and the carrying out of this process by means of the machine whose embodiment has just been described, produces a sleeve whose corrugations have a strictly constant profile without the material employed undergoing any deformation.

It is also possible by means of the invention to obtain flat corrugated sheets obtained from corrugated sleeves obtained in the above-described manner, thereby described, being subsequently split along a generatrix, preferably in the region of the weld line, and developed on a plane.

Although a specific embodiment of the invention has been described, many modifications and changes may be made therein without departing from the scope of the invention as defined in the appended claims.

In particular, according to a variant of the invention, a frustroconical corrugated sleeve can be obtained in a manner substantially similar to that described. The corrugations can be helical or perpendicular to the axis of the cone.

FIGS. 12-17 relate to this variant.

FIG. 12 shows a conical sleeve 4A before folding and at 4AP this sleeve in the folded state, it being clear that the folding of this sleeve results in a variation in the conicity owing to the decreases in the length from l1 to l2 consequential to the folding of the same. The changes in the length are shown in the illustrations. Another consequence of this folding is the displacement of the apex of the cone from the point S0 to the point S2.

The folding method described hereinbefore is applicable to the folding of a conical sleeve under the same conditions as a cylindrical sleeve, i.e. in the case of a conical sleeve the apex is so disposed (FIG. 13) that the generatrix G1 of the cone (which has its apex at S2) is parallel to the axis X1 and
X₂ of the forming rollers 10 and 11 and between the latter, the point a of intersection of the generatrix G₁ and the generatrix G₂ of the unfolded sleeve coincides with the pitching point of said rollers and, when it is desired to obtain a continuous corrugation, the preparation of the sleeve (FIG. 12) includes steps or offsets 6 on the weld line 8 as in the case of a cylindrical sleeve described hereinbefore.

FIG. 14 shows a conical sleeve 4A in the course of folding. There is employed when folding a conical sleeve, a special support 7A. FIG. 14 also shows the cylinders 10, 11 carrying the folding rollers 1 (the rollers 2 are not seen) and the arms 24a, 24b carrying the cylindrical rollers 25a, 25b and the forming rollers 26a, 26b, these arms acting as means for maintaining the unit 101. The operation of the machine shown in FIG. 15 is based on the principle illustrated in FIG. 13, the sleeve-folding principle remaining that pertaining to cylindrical sleeves.

For purposes of simplification, the guide rollers have been eliminated, these rollers bearing in the hollows of the helical corrugations and permitting the screwing motion of the sleeve in the course of folding.

It will be obvious that the production of parallel corrugations is possible by successive displacements of the forming rollers 10, 11; that the production of a portion of a conical sleeve with parallel corrugations is also possible in these conditions and that the dimensions of the elements to be folded are only limited by the possibilities of the machine.

The method is clearly also applicable in the production of a bi-conical convex folded sleeve (FIG. 16) or concave folded sleeve (FIG. 17) from a convex bi-conical smooth sleeve 4A₁ or concave bi-conical smooth sleeve 4A₂, the two apices of the two cones moving, in the course of the corrugation, toward the final positions S₁, S₂, these results being obtained by means of machines based on the same principle as the machine shown in FIG. 15.

It must be understood that in all embodiments of the machine according to the invention the elements control ling the rollers and other moving parts can be actuated by means other than hydraulic jacks; for example, these means could be mechanical, electrical or pneumatic devices.

The sleeves employed can be closed or open and have cross-sections other than circular. The corrugations can have perpendicular ribs on the flanks of the corrugations. The helical corrugations can have a single start or a plurality of starts, all these corrugations being formed in one or several runs through the machine with materials of any shape, type and thickness.

Having now described our invention what we claim as new and secure to be Letters Patent is:

1. A method for folding corrugations in sheet material, comprising passing the sheet between forming rollers having conjugate profiles and, in the course of folding, constantly containing the blister—which is formed between limits which are fixed relative to the pinching zone of the forming rollers.

2. A method as claimed in claim 1, wherein the blister is contained by pressure-applying elements in contact with the sheet on both sides, said elements being applied with sufficient pressure to form abutment lines consistently preventing the blister from spreading beyond said lines, the latter being fixed relative to said pinching zone and located on the upstream side of said zone relative to the direction of feed of the sheet.

3. A method as claimed in claim 1, wherein in the case where the folding comprises a series of evenly spaced juxtaposed parallel series of corrugations each corrugation is employed as a guide for the formation of the next adjacent corrugation.

4. A method for folding corrugations in sheet material, comprising passing the sheet between forming rollers having conjugate profiles and, in the course of folding, constantly containing the blister—which is formed at the end of the corrugation in course of formation—between limits which are fixed relative to the pinching zone of the forming rollers, wherein the folding being effected on a sheet in the form of a sleeve and comprising a single helical corrugation.

5. A method as claimed in claim 4, wherein the sleeve is composed of a sheet wound in the form of a cylinder and having two abutting ends welded together, an offset in a direction parallel to the axis of the sleeve which is proportional to the developed length of the profile of the corrugation to be formed being provided between the two welded ends, the first coil of the helix being obtained by making use of the edge of the sleeve as a guide,
the other coils being formed by employing the preceding coil as a guide.

6. A method as claimed in claim 4, wherein in order to obtain a plane folded sheet the sleeve is cut along the butt weld and is developed in a plane.

7. A method as claimed in claim 1, for folding a sleeve having at least one frustum of a cone, the folding resulting in a reduction in the length of the apothem of the frustum of the cone and in an increase in the angle of conicity, said method being such that in the course of the folding the sleeve is constantly supported by support and guide means in contact with the surface of the sleeve, and the position and orientation of these means are modified as a function of the changes in the shape, dimension, position and orientation undergone by the sleeve in the course of said folding, whereby said means constantly perform their sleeve supporting and guiding functions.

8. A folding machine for forming corrugations in sheet material, said machine comprising at least one pair of forming rollers having conjugate profiles, driving means for driving said forming rollers at the same linear speed, and means for carrying and guiding the sheet to be folded, there being provided elements for containing the blister which is constantly formed in front of the portion of corrugation which is on the point of being formed, said containing elements being in contact with the sheet to be folded.

9. A machine as claimed in claim 8, wherein said elements comprise a pair of rollers applied against the sheet to be folded immediately on the upstream side of the pinching zone of the forming rollers relative to the direction of movement of the sheet.

10. A machine as claimed in claim 9, wherein at least one of the containing rollers is mounted on a movable support which permits selectively moving said containing roller away from the sheet and applied thereto against.

11. A folding machine for forming corrugations in sheet material, said machine comprising at least one pair of forming rollers having conjugate profiles, driving means for driving said forming rollers at the same linear speed, and means for carrying and guiding the sheet to be folded, there being provided elements for containing the blister which is constantly formed in front of the portion of corrugation which is on the point of being formed, said containing elements being in contact with the sheet to be folded, said sheet being rolled and welded so as to form a sleeve, said machine further comprising a support cylinder on which the sleeve to be folded is axially, axially slidable, and means for maintaining and supporting the cylinder and sleeve in the course of their movement of rotation caused by the rotation of the pair of forming rollers.

12. A machine as claimed in claim 8, further comprising a self-guiding roller rigidly coupled to each of the forming rollers, the spacing between each pair of coupled rollers being equal to the pitch of the corrugations, the self-guiding rollers being disposed and orientated in such manner that the preceding corrugation formed is inserted between the two male and female self-guiding rollers.

13. A machine as claimed in claim 12, wherein said forming rollers are rigidly coupled to a plurality of other forming rollers having profiles of increasing diameters whereby each corrugation is formed in a plurality of passages of the sheet material through the machine.

14. A machine as claimed in claim 13, wherein said machine further comprises at least one pair of further forming rollers in which the formed corrugation is inserted so as to precisely position the sheet.

15. A machine as claimed in claim 8, wherein said machine comprises positioning rollers and movable supports for said positioning rollers which permit applying the positioning rollers on the edges of said sheet material.

16. A machine as claimed in claim 8, wherein said machine comprises positioning rollers and movable supports for said positioning rollers which permit applying the positioning rollers on the surface of said sheet material.

17. A machine as claimed in claim 15, wherein the movable supports are combined with actuating means which selectively apply the positioning rollers in an operative position against the sheet material and withdraw them to a position in which they are inoperative.

18. A folding machine as claimed in claim 8 for forming corrugations on sheets having at least one frustum of a cone wherein the sleeve is carried by support and guide means comprising a first series of cylindrical means mounted on a fixed unit and positioned and orientated in such manner as to be constantly in contact with the smooth uncorrugated part of the sleeve along generatrices whose extensions are concurrent at the moving geometric apex of said smooth part, and a second series of cylindrical means mounted on a movable unit and positioned and orientated in such manner as to be constantly in contact with the folded part of the sleeve along lines of contact which are concurrent at the moving geometric apex of said folded part.

19. A folding machine as claimed in claim 17, wherein the movable unit is slidably mounted so as to be movable in translation along a straight line parallel to the axes of the two forming rollers.

20. A folding machine as claimed in claim 18, comprising a lead-screw system for controlling the movement of translation of the movable unit in synchronism with the movement of the forming rollers, and guide rods parallel to the axes of said forming rollers guiding the movable unit.

21. A folding machine as claimed in claim 19, comprising mechanisms for moving said cylindrical means on their respective units, at one of their ends, said mechanisms being synchronized with the movement of the forming rollers and automatically modifying the position of each of the means on the unit therefor and the orientation of each of said means, so as to achieve constantly contact of said means with the sleeve and the convergence of said means.

22. A machine as claimed in claim 16, wherein the movable supports are combined with actuating means which selectively apply the positioning rollers in an operative position against the sheet material and withdraw them to a position in which they are inoperative.

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