Nov. 9, 1965 P. VOELSKOW 3,216,059

APPARATUS FOR PRODUCING FIBERBOARD SHEETS

Filed Sept. 27, 1962 5 Sheets-Sheet 1

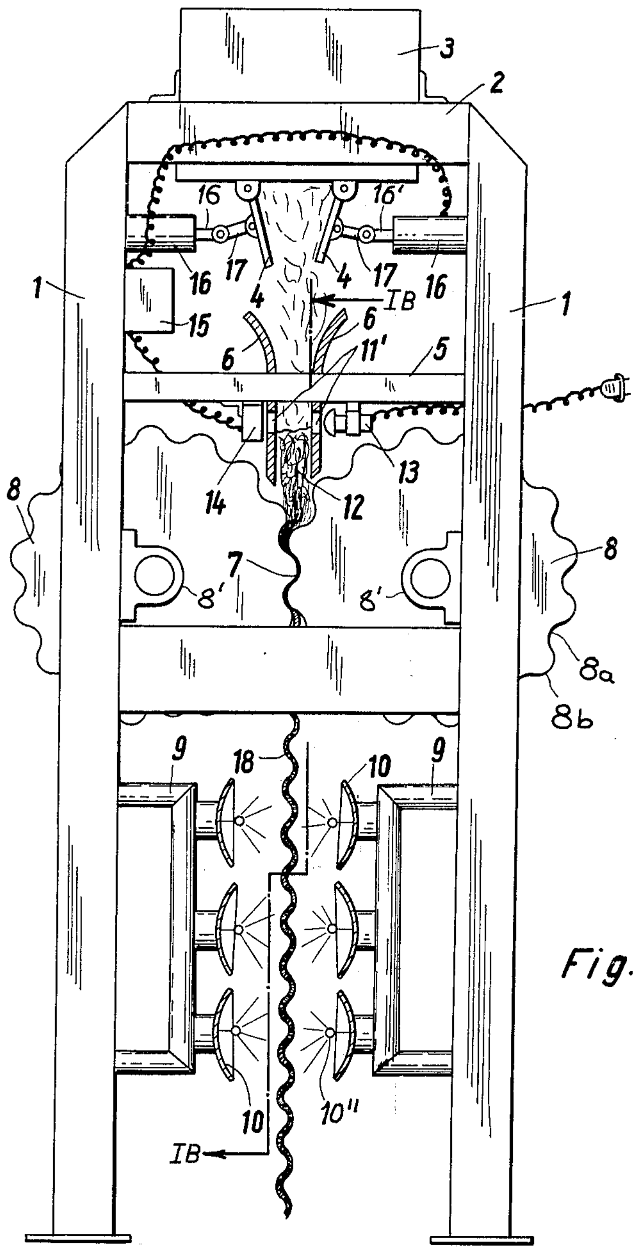

Fig.1

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APPARATUS FOR PRODUCING FIBERBOARD SHEETS

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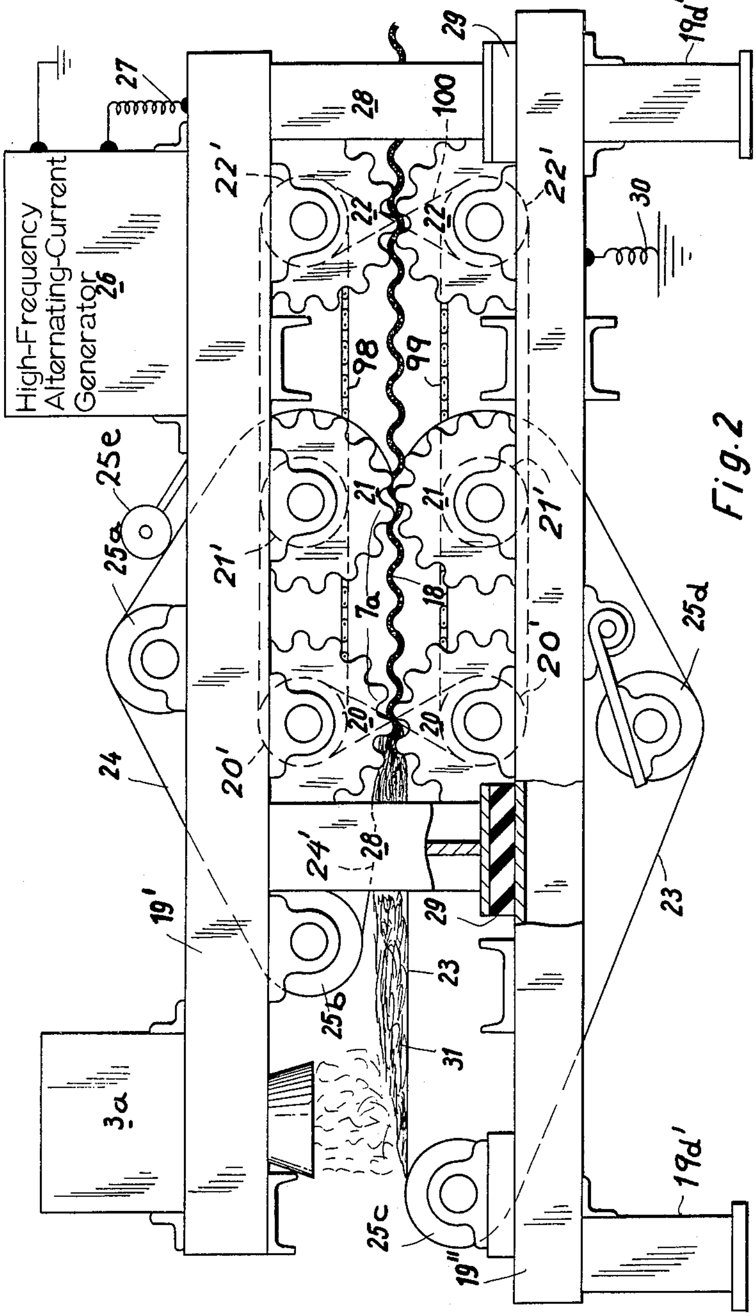

Fig. 2

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APPARATUS FOR PRODUCING FIBERBOARD SHEETS

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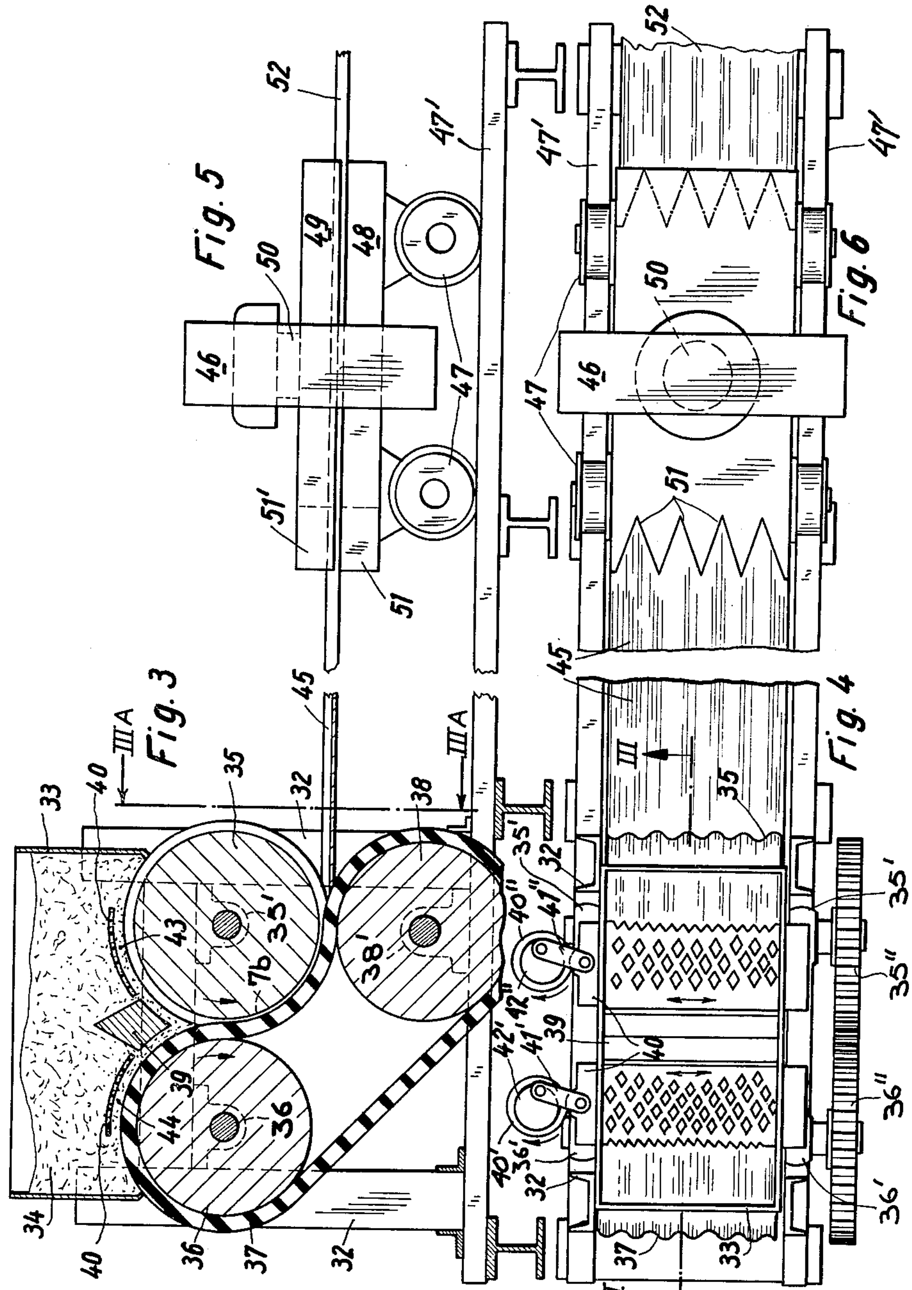

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APPARATUS FOR PRODUCING FIBERBOARD SHEETS

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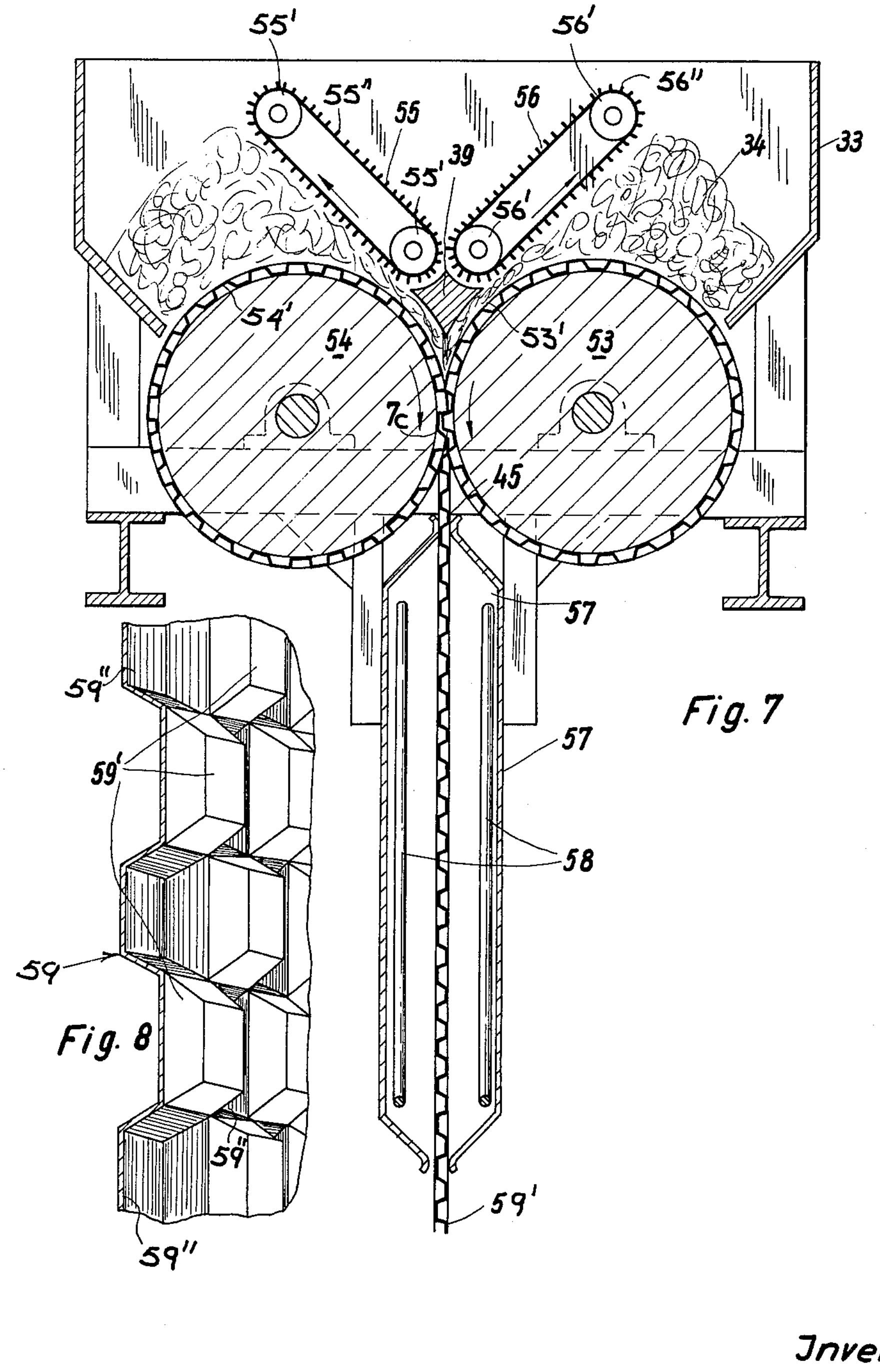

Fig. 7

Fig. 8

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APPARATUS FOR PRODUCING FIBERBOARD SHEETS

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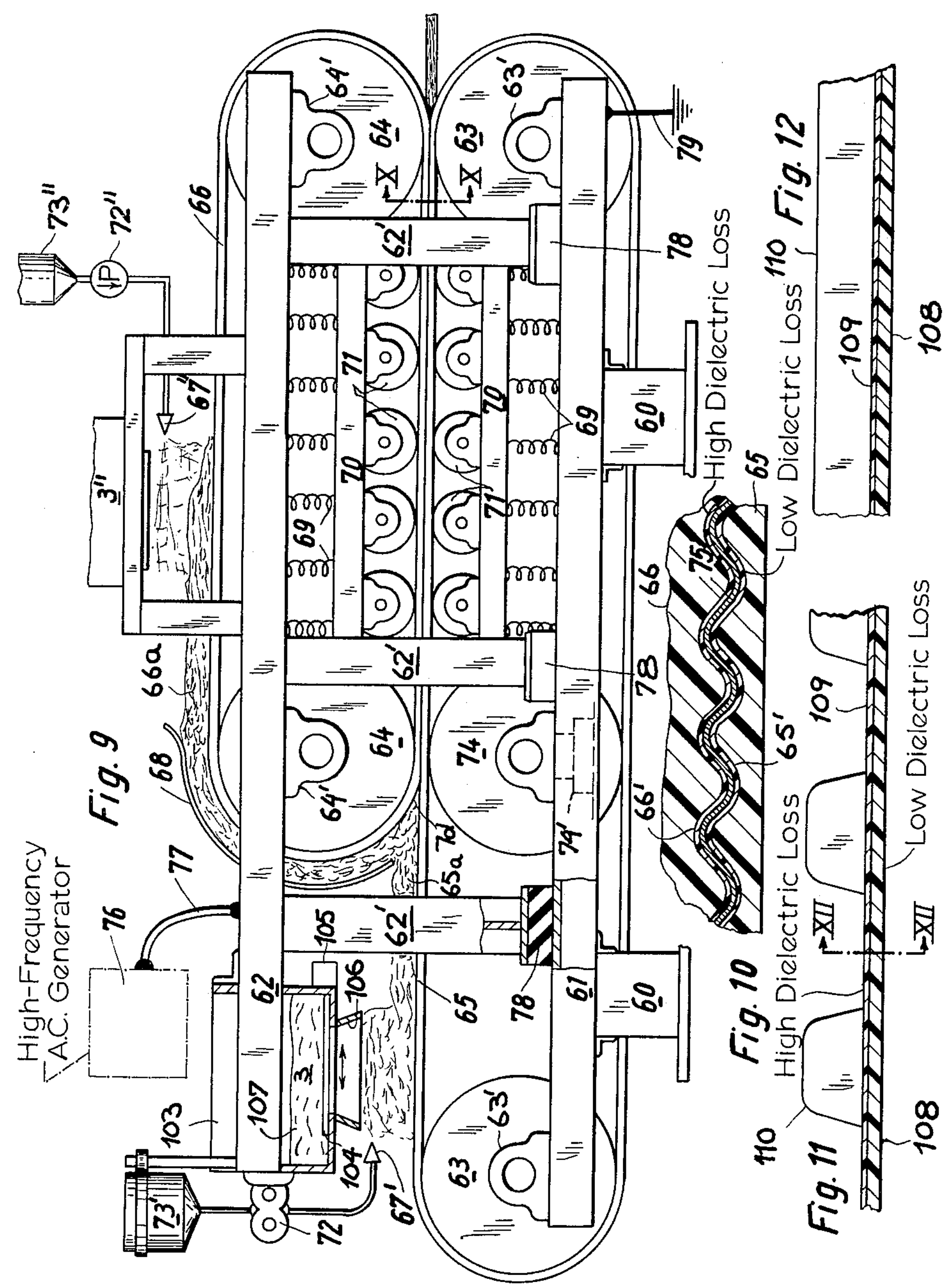

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3,216,059
APPARATUS FOR PRODUCING FIBERBOARD SHEETS
Peter Voelskow, Am Rolande 44, Holle uber Hildesheim, Germany
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Claims priority, application Germany, Sept. 29, 1961, V 21,384
9 Claims. (Cl. 18—4)

The present invention relates to fiberboard sheets having periodically spaced deformations and, more particularly, to apparatus for producing such sheets from a mass of fibrous material and a binding agent.

Heretofore fiberboard sheets of the character described have been produced by adding synthetic-resin binders to wood-chips and other cellulosic fibrous material, generally designated "wool," which were initially compacted in a preliminary shaping step into a dense and coherent mass. This coherent mass was then passed between heated platens which compressed them further to their final or end thickness and cured the binder. Reference to a "binder" for the fibrous wool in the present application is considered to include additive binders, such as synthetic resins; intrinsic binders, such as the lignin generally contained in cellulosic products having a wood origin; and other substances which, in the presence of heat and/or pressure, effect a bonding of the dense fiber mass and result in relatively tough fiberboard sheets. Since known methods of producing such sheets require that the fibrous mass be prepressed into a blank having a relatively small thickness which is, nevertheless, considerably larger than the end thickness, deformation of the sheets during the final compaction stage to produce corrugations and the like can only be used if such corrugations are of relatively small height in comparison with the thickness of the sheet. These techniques, which employ heated platens, have been found to be totally unsatisfactory for the production of spacedly deformed sheets whose corrugations or deformations have relatively large heights.

It has been proposed hithereto to employ profiled rollers between which the prepressed blank is passed to produce the aforementioned corrugations. A similar technique involves the use of continuously moving profile bands which are designed to shape the previously compacted mass of fiber. These methods have, however, the disadvantage that initial compaction renders the fibers coherent so that the subsequent dislocation and shaping step effects a rupture of many of these fibers and a considerable weakening of the resulting fiberboard sheet. Weakening of the bond between the fibers also results from other methods of producing deformed fiberboard sheets wherein a planar or flat sheet is alternately bent in opposite directions transverse to its major dimension to produce corrugations.

It is an object of the present invention to avoid the disadvantages of known methods of fiberboard-sheet production by providing means for producing deformations in such sheets without incumbent rupture of the fiber bonds and of the fibers themselves.

It is another object of this invention to provide apparatus for producing such sheets at a rapid rate with a minimum of expense.

An essential feature of the present invention resides in the fact that means are provided whereby a mass of fibrous cellulosic material in a loose, non-coherent state is compacted to substantially the desired end thickness of the resulting fiberboard by passage between a pair of juxtaposed cylindrical compression surfaces having a distance of closest approach equal substantially to this end thickness. The present system thus avoids the preliminary shaping of the mass from a noncoherent state into a more dense coherent blank in which bonding of fiber has taken place to a certain extent. By proceeding directly from the loosely coherent state to the final compaction of the sheet rupture of any fiber bond is entirely eliminated. Since the fibrous mass contains a thermally curable binder which, as previously mentioned, may be intrinsic or added, the compacted sheet is subsequently passed through a heating or curing zone wherein the final bond between the fibers is established.

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As it is desired to produce profiled fiberboard sheets with periodically spaced deformations (e.g. longitudinally or transversely extending corrugations), the compacting surfaces are profiled correspondingly and are constructed as closed or endless surfaces. Since the corrugations are pressed into the board simultaneously with the compaction of the fibrous material from their loose or noncoherent state, no regions of reduced strength are produced as a consequence of weakening of the fiber bond. According to a more specific feature of the invention, apparatus for producing fiberboard sheets comprises a spreading device for depositing the fibrous material loosely upon at least one of the surfaces and guide means for directing the material into the inlet gap between the two cylindrical surfaces. These two surfaces diverge from their region of closest approach in the direction of the spreading device so as to afford a gradual compression of the material as the latter is carried by the surfaces from the wider portions of the gap into the region of closest approach.

Either or both of the juxtaposed cylindrical surfaces may, according to another aspect of the invention, be formed as a drum or endless conveyor band. Such apparatus renders it possible to produce fiberboard of substantially uniform and constant specific gravity and to control this specific gravity by adjusting the rate at which the loosely coherent material is fed into the gap. Thus sensing means, responsive to the rate at which the fibrous wool is fed into the gap, may be provided for controlling the spreading device or the guide means therefor. Such sensing means may include a photoelectric cell which responds to the level of the wool between guide plates adjacent the gap constituting the guide means. To this end it is advantageous to dispose the juxtaposed surfaces so that the gap directly underlies the guide plates which form a chute for the fibrous material deposited from the spreading device overlying the chute. In this case the guide surfaces are advantageously constituted by a pair of profiled rollers or drums whose substantially horizontal axes lie in a plane generally perpendicular to the downwardly moving fiberboard sheet. The curing zone may then include heating means, advantageously disposed on both sides of the outgoing sheet, located below the rollers in alignment with the gap.

One or both of these rollers may, if desired, be replaced by a contoured endless band which, according to another feature of the invention, cooperates with the other roller or band to form the progressively narrowing gap leading to the region of closest approach. In each case, however, deformation takes place between a pair of complementarily profiled elements whose juxtaposed compression surfaces are defined by generally parallel generatrices.

Another particular feature of the invention resides in the use of an endless flexible support for the fiber wool. This support which may, for example, be a relatively thin fabric band which passes over at least one profiled surface and, consequently, conforms thereto for compaction of the loosely coherent material to the end thickness and density of the board in cooperation with another profiled surface juxtaposed therewith. A second flexible band is generally provided for the other profiled surfaces so that the loosely coherent material is entrained between these bands and fed thereby into the compression gap. These bands thus prevent displacement of the loosely coherent mass as might otherwise occur upon engagement therewith by the rollers to alter the quantity of the loose material passed through the gap within a given time period. The density of the resulting fiberboard is not markedly altered as a consequence of the displacement of the loosely coherent material. To facilitate entrainment of this material by the two flexible bands, these bands are provided with substantially codirectionally extending reaches rearwardly of the gap between the profiled surfaces and between the latter and the spreading device for maintaining the level of the loosely coherent layer deposited upon a horizontal pass of the band substantially constant.

It has been found to be advantageous to deposit the loose wool in two layers, one upon each of the profiled surfaces, whereupon the layers merge or coalesce at the gap. It may be noted that the two layers may be of somewhat different composition if a laminated end product is desired. In order to insure that the fiber wool is noncoherent or loose prior to its entry between the compaction rollers, agitating means are provided between this gap and the source of the fibrous material for continuously breaking up clumps thereof prior to its passage into the gap. Such agitating means may be provided within the spreading device or in a supply receptacle formed directly above the gap between the surfaces and may comprise moving members which repeatedly stir and shake the fiber wool. Movable members of this type include oscillating grates, screens and grills as well as rakes, scrapers and other members displaceable in a single sense. To subdivide the fibrous material into two layers a baffle or partition means may be disposed at the gap. The use of endless profiled bands permits elimination of profiled rollers or drums for similar functions. Thus the bands may be carried by cylindrical drums and may serve as compression members and/or heating elements. If the drums are to be used as heating means, it is preferred to provide a source of heating fluid and to construct the drum with an interior opening through which the heating fluid can pass.

It is also contemplated to employ two complementary profiled endless bands which are disposed one above the other, the upper band being offset from the lower band in the direction of displacement thereof so that an upwardly facing reach of the lower band may be aligned with a spreading device. The upper band is also provided with a horizontally extending upwardly facing reach above which a further spreading device may be disposed, if desired, for depositing additional fiber wool thereupon. In this case a guide plate, shaped to conform to the upper band, is limitedly spaced therefrom to hold the fibrous material thereagainst as it is drawn into the gap.

The above and other objects, features and advantages of the present invention will become more readily apparent from the following description, reference being made to the accompanying drawings in which:

FIG. 1 is a side-elevational view of a fiberboard-producing apparatus according to the invention;

FIG. 1A is a circuit diagram of the sensing means of the embodiment shown in FIG. 1;

FIG. 1B is a cross-sectional view taken generally along the line 1B—1B of FIG. 1;

FIG. 2 is a side-elevational view, partly broken away, of another apparatus;

FIG. 3 is a cross-sectional view taken along the line III—III of FIG. 4, showing the feed means and compression surfaces of yet another apparatus according to the invention;

FIG. 3A is a cross-sectional view taken along the line IIIA—IIIA of FIG. 3;

FIG. 4 is a plan view of the portion of the apparatus shown in FIG. 3;

FIG. 5 is a side-elevational view of the heating zone of this apparatus;

FIG. 6 is a plan view thereof;

FIG. 7 is a transverse cross-sectional view of an apparatus for producing honeycombed fiberboard sheets;

FIG. 8 is a somewhat perspective view of a portion of the honeycombed sheet;

FIG. 9 is a side-elevational view, partly broken away, of still another embodiment of the invention;

FIG. 10 is across-sectional view taken along the line X—X of FIG. 9 illustrating the profiled bands;

FIG. 11 is a longitudinal cross-sectional view through another band; and

FIG. 12 is a cross-sectional view taken along the line XII—XII of FIG. 11.

The apparatus shown in FIGS. 1, 1A and 1B comprises a stand whose uprights **1** carry a crosspiece **2** upon which a spreading device **3** is disposed. This spreading device, as described in greater detail hereinafter, is provided with a hopper for the fibrous wool and an oscillating grate for agitating this wool and breaking up clumps thereof prior to dispensing it toward the compaction gap. A pair of outlet flaps **4** are disposed at the mouth of the spreading device **3** for controlling the rate at which the fibrous material is dispensed. A pair of crossbars **5**, rigid with the posts **1**, carry a pair of guide plates **6** constituting a chute for the fibrous material. This chute is disposed just above the gap **7** between a pair of compaction rollers or drums **8** whose shafts are journaled for rotation about coplanar horizontal axes in pillow blocks **8'** secured to the uprights **1**. The drums **8** are provided with axially extending circumferential grooves **8*a*** and ridges **8*b*** in the form of peripheral corrugations, the corrugations of both drums complementarily mating at the region of closest approach wherein they are spaced by a distance equal substantially to the thickness of the finished sheet. The gap **7** converges toward the point of closest approach in the direction of displacement of the drums in this region.

The lower portion of the support carries a pair of holders **9**, secured to the posts **1** on opposite sides of the resulting corrugated sheet **18**, which bear radiant heaters **10** serving to cure the binder contained within the fibrous mass. These heaters **10** each comprise a longitudinally extending reflector **10'** (FIG. 1B) and a heating element **10''** disposed at the focus of each reflector.

The plates **6** constituting the chute for the fibrous wool are each formed with a respective opening **11'** which accommodate sensing means including a photoelectric cell **14** and a source **13** of illumination. The sensing means is responsive to the level of the material **12** within the chute and, via a relay **15**, controls the flaps **4** which determine the rate at which the fiber material passes into the gap. As may be seen from FIG. 1A, the light source **13** is connected to an alternating-current line **93** which, in turn, feeds the switch **15'** of a relay **15** which is energized by the photoelectric cell **14** via an amplifier **94**, if necessary. Switch **15'** is connected in series with a pair of solenoids **16** whose armatures **16'** are pivotally connected with the flaps **4** by links **17**. If the level of the material **12** between the plates **6** rise to obstruct the openings **11'**, illumination from lamp **13** will be cut off to de-energize the photocell **14** and its relay **15** whereupon switch **15'** opens so that springs **95** are able to shift the armatures **16'** inwardly and close the flaps **4** until the level has lowered sufficiently for the lamp **13** to reactivate the photocell **14**.

The loose fiber wool cascading from the spreader **3** accumulates in the noncoherent mass **12** between the plates **6** whose distance from one another is in such proportion to the distance of closest approach of the drums **8** that the outgoing sheet **18** will have the proper density. The width of the space **12** is maintained constant by the plates **6**. It will be immediately apparent that no precompression occurs with the instant apparatus for subsequent alteration. The simultaneously molded and compacted sheet

18 then passes into a heating zone where it is cured by infrared heaters 10. The fibrous material 12 may be cellulosic in nature and derived from wood. It also may contain a binder such as ureaformaldehyde resin whose hardening is facilitated by the addition of a so-called "hardener" such as ammonium chloride. The hardener may be added just prior to the compaction of the mass, by a spraying device, in the form of a liquid having a minimum ammonia content.

In FIG. 2 I show a horizontal apparatus wherein legs *19d'* carry horizontally extending supports 19', 19'' upon which pairs 20, 21 and 22 of profiled drums are journaled in their respective pillow blocks for rotation about coplanar horizontal axes. The compaction rollers 20 form between them a gap *7a* to which the noncoherent material is led from a spreading device *3a* which deposits the wool upon a lower flexible band 23. This relatively thin band, which may be formed from a fabric or the like, has a horizontal reach 23' disposed below the spreader *3a* and passes over an idler roll *25c* in addition to the drums 20, 21. A spring-loaded take-up roll *25d* bears upon band 23 and causes it to hug the drums 20, 21. An upper band 24, of like material, passes over a pair of idlers *25a*, *25b* in addition to the drums 20, 21 journaled of the upper support 19' while a take-up roller *25e* serves to tension this band. Band 24 is likewise provided with a substantially horizontal reach 24' which cooperates with band portion 23' to maintain a substantially constant level of wool 31 thereon. The bands, being thin and flexible, do not compress the wool so that the uncompacted material is carried by them into the gap *7a* for compression as previously described. The rollers 20, 21 and 22 of the upper and lower portions of the support are each provided with respective sprocket wheels 20', 21', 22' over which passes a chain 98, 99 for driving them with identical peripheral speeds in the appropriate directions. The two banks of drums are interconnected by a further chain 100 imparting driving motion to the upper bank from the lower bank, one of whose drums is rotated by a motor not shown. Since the bands 23, 24 are flexible they conform to the contours of the peripherally corrugated drums 20, 21 so that these contours are molded into the outgoing sheet 18. Induction-heating means is provided to cure sheet 18. This heating means includes a high-frequency alternating- current generator 26 one of whose terminals is grounded while the other is connected to the conductive upper support 19'. The latter is secured via uprights 28 to the conductive lower support 19'' which is likewise grounded. Uprights 28 are electrically insulated from the lower support 19'' by blocks 29 of nonconductive material. High-frequency alternating current is thus applied via the supports 19', 19'' to the conductive drums 22 whereupon heat is developed in this region across the sheet 18 whose high dielectrical loss factor results in considerable dissipation of energy. The drums 20 and 21, being conductively coupled with the supports 19', 19'', likewise serve to heat the sheet 18 and, in effect, serve as preheating means.

In FIGS. 3–6 there is shown another device for producing corrugated sheets wherein, however, the corrugations extend longitudinally rather than transversely as was the case with the devices of FIGS. 1 and 2. In this embodiment a support 32 carries the pillow blocks 35', 36' of an annularly profiled drum 35 and a cylindrical drum 36 over which passes a profiled band 37 cooperating with drum 35. Band 37 also passes over the cylindrical drum 38, journaled to the support 32 at 38', and hugs the drum 35 over a considerable portion of its periphery. A supply hopper 33 is disposed above drum 35 and band 37 in alignment with the gap *7b* therebetween. A partition or baffle 39 extends upwardly from this gap as a flow separator to subdivide the fiberwool mass 34 into two layers 43, 44 which are drawn together and merged in the gap *7b*. A pair of oscillating grates 40 serve to loosen the material and to prevent its agglomeration prior to passage into this gap. To this end the grates 40 are provided with respective links 41', 41'' articulated to eccentrics 42', 42'' driven by the motors 40', 40'', respectively. The grates are thus oscillated in a direction transverse to the direction of displacement of the fibrous material and generally in a horizontal plane. Drum 35 carries a gear 35'' in mesh with a similar gear 36'' of cylindrical roll 36 to couple this roll with the drum for concurrent rotation in opposite senses. The drum 35 and the band 37 thus operate with identical peripheral speeds in the region of gap *7b*.

The compacted sheet 45 emanating from the gap is then cured with the aid of the apparatus shown in FIGS. 5 and 6. This apparatus comprises a press 46 whose piston-and-cylinder arrangement 50 serves to displace an upper platen 49 relatively to a lower platen 48. The press is carried upon wheels 47 along rails 47' for displacement at a rate identical with that of the sheet 45 to be cured. The upper and lower platens 48, 49 are provided with large teeth 51, 51'. As the uncured sheet 45 travels along the rails 47' the press 46 engages it over a considerable portion of its length and effects curing thereof to produce the hardened final sheet 52. Upon displacement of this sheet 52 to the right (FIG. 5) by a distance equal approximately to the lengths of the platens 48, 49, the press 46 is opened, returned to its original position, closed to re-engage the sheet and again displace along the track together with the sheet. The teeth 51, 51' produce an interleaved junction between the uncured sheet 45 and the cured sheet 52 so that weakening of the sheet at the junction between the cured and uncured portions can not occur. The dot-dash showing of this junction in FIG. 6 indicates how successive curing stages overlap to prevent omission of curing at the junctions.

The apparatus shown in FIG. 7 comprises a pair of complementarily profiled drums 53, 54 whose projections and recesses mate to form a honeycomb sheet 59 (FIG. 8). The sheet has elevations 59' and recesses 59'' of frustopyramidal configuration and rectangular cross-section. Drums 53, 54 form between them a gap *7c* above which is disposed a partition 39' which subdivides the fiberwool mass 34' within the hopper 33' into two layers 53', 54' fed by the drums into the gap. A pair of moving continuous bands 55, 56 are carried by respective rollers 55', 56' and are formed with projections 55'', 56'' to engage the wool and scrape it away from the gap so that only loose material can pass into this region, these bands thus serving as a sorting means with the same object as the grates 40 of FIGS. 3 and 4. The uncured honeycomb sheet 45 then proceeds into a heating channel 57 within which undulating tubes 58 for a heating fluid are disposed. The radiant energy from these tubes serves to cure the sheet to produce the honeycomb structure shown in FIG. 8 in which hollow frustopyramids extend alternately to opposite sides of a median plane.

FIGS. 9 and 10 show still another embodiment of the invention wherein the legs 60 carry a base 61 upon which a table 62 is disposed. Table 62 is supported by uprights 62' upon electrically insulating pads 78 and carries a spreading device 3' of the type shown at 3 and *3a* in FIGS. 1 and 2. The spreading device is formed with a hopper 103 within which a grate 104 is oscillated by an eccentric 105 at the mouth 106 to dispense the fiber wool 107. As shown in FIG. 9, the lower belt 65, which is carried by a pair of rollers 63 journaled in pillow blocks 63' upon the base 61, is offset rearwardly of the compressing gap *7d* and thus has a horizontal reach above which the spreader 3 is disposed for depositing a layer *65a* of the noncoherent material 107 thereon. Uprights 62' also serve as rails for guiding a pair of vertically displaceable pressure heads 70 carrying rollers 71 which urge the bands 65, 66 together under the pressure of springs 69. The upper band 66 passes over a pair of cylindrical rollers 64 whose pillow blocks 64' are secured to the upper support member 62.

The latter also carries another spreading device 3″ for depositing a layer 66a of loose fibrous wool upon an upper reach of band 66. A guide plate 68 spaced from this band by a distance equal to the height of the layer 66a and conforming to the configuration of the band guides this layer into the gap 7d where it merges with layer 65a of band 65.

Receptacles 73′, 73″ for a hardener, which together with the binder intrinsically present in the fibrous wool forms a bonding agent having a relatively short pot life or effective curing time, is disposed adjacent each spreading device and supplies a respective metering pump 72′, 72″. The pumps feed the spray nozzles 67′, 67″ for adding a predetermined proportion of this hardener to the loose material. As previously mentioned, the hardener may be a solution of ammonium chloride having a low ammonia content. This hardener forms with an already present binder such as ureaformaldehyde resin an extremely effective bonding agent having a short pot life. The merging layers 65a, 66a of fibrous wool are compressed between the profiled bands 65, 66 (FIG. 10) to compact the material thereof to the required density and thickness. A compression roller 74 is juxtaposed with the rearward roller 64 to support the band 65a at this location. The position of drum 74 may be adjusted with the aid of a hydraulic cylinder 74′. The loose material is compacted only upon passage through gap 7d and is hardened in the region of the pressure elements 71.

A high-frequency alternating-current generator 76 is connected across support members 61, 62 and thus across the pressure heads 70 to subject the fiber board to high-frequency dielectric heating. To facilitate the heating of the board I prefer to form the bands 65, 66 from substrates having a relatively low dielectric-loss factor (e.g., polytetrafluoroethylene or silicon elastomer) and to provide their confronting surfaces adjacent the board 75 with a layer 65′, 66′ having a relatively high dielectric-loss factor so that a substantial amount of energy is dissipated by this layer adjacent the board. A suitable material having a high dielectric-loss factor is polyvinyl chloride.

In FIGS. 11 and 12 I show another band for forming corrugated sheets wherein a substrate 108 is provided with a layer 109 of a material having a high dielectric-loss factor. The spaced ridges 110 of this band are somewhat higher than those of normal corrugated sheets and serve to produce lightweight structural members of high strength.

I claim:

1. A device for producing plates with a recurring pattern of surface deformations from a loose noncoherent mass of fibrous cellulosic material admixed with a binder, comprising a pair of complementarily profiled rotatable forming elements with juxtaposed endless compression surfaces defined by generally parallel generatrices and separated at their point of closest approach by a clearance substantially corresponding to the thickness of the plates to be produced; drive means for concurrently rotating said elements at identical peripheral speeds; guide means including said elements forming a gap of progressively decreasing width converging toward said clearance; hopper means ahead of said guide means for funneling a continuous supply of said mass directly into said gap; curing means beyond said point of closest approach for hardening a deformed plate formed by compaction of the funneled mass; and sorting means at said gap for keeping coherent formations of said fibrous material away from said clearance.

2. A device as defined in claim 1 wherein said sorting means comprises perforated screen means at the approaches to said gap and mechanism for agitating said screen means.

3. A device as defined in claim 2 wherein said screen means comprises a pair of screens on opposite sides of said gap, said guide means including a stationary flow separator positioned between said screens.

4. A device as defined in claim 1 wherein said elements comprise a pair of endless flexible bands disposed substantially horizontally one above the other, the lower one of said bands having a surface projecting rearwardly beyond the upper band, said hopper means including a spreader disposed above said projecting surface for depositing said material thereon.

5. A device as defined in claim 4 wherein said hopper means further includes another spreader disposed above said upper band, said guide means including a curved plate concentrically embracing a curved terminal portion of said upper band for directing the output of said other spreader to the entrance of said gap for confluence with the material deposited on said projecting surface.

6. A device for producing plates with a recurring pattern of surface deformations from a loose noncoherent mass of fibrous cellulosic material admixed with a binder, comprising a pair of complementarily profiled rotatable forming elements with juxtaposed endless compression surfaces defined by generally parallel generatrices and separated at their point of closest approach by a clearance substantially corresponding to the thickness of the plates to be produced; drive means for concurrently rotating said elements at identical peripheral speeds; guide means including said elements forming a gap of progressively decreasing width converging toward said clearance; hopper means ahead of said guide means for funneling a continuous supply of said mass directly into said gap; curing means beyond said point of closest approach for hardening a deformed plate formed by compaction of the funneled mass; said guide means forming a chute substantially wider than said clearance above said elements, said hopper means being disposed above said chute for continuously depositing a pile of said material in said chute; and control means responsive to the height of said pile for maintaining the quantity of said material in said chute substantially constant by regulating the supply rate of said hopper means in conformity with departures of said height from a predetermined level.

7. A device as defined in claim 6 wherein said chute has a pair of opposite walls provided with aligned openings at said level, said control means including a source of illumination at one of said openings and photoelectric means at the other of said openings.

8. A device for producing plates with a recurring pattern of surface deformations from a loose noncoherent mass of fibrous cellulosic material admixed with a binder, comprising a pair of complementarily profiled rotatable forming elements with juxtaposed endless compression surfaces defined by generally parallel generatrices and separated at their point of closest approach by a clearance substantially corresponding to the thickness of the plates to be produced; drive means for concurrently rotating said elements at identical peripheral speeds; guide means including said elements forming a gap of progressively decreasing width converging toward said clearance; hopper means ahead of said guide means for funneling a continuous supply of said mass directly into said gap; curing means beyond said point of closest approach for hardening a deformed plate formed by compaction of the funneled mass; said elements comprising a pair of endless flexible bands disposed substantially horizontally one above the other, the lower one of said bands having a surface projecting rearwardly beyond the upper band, said hopper means including a spreader disposed above said projecting surface for depositing said material thereon; said bands being provided with electrically conductive supporting rollers, said curing means comprising high-frequency dielectric heating means connected across said rollers, said bands each including a substrate of a material having a low dielectric-loss factor and a heating layer of a material having a high dielectric-loss factor carried on said substrate adjacent said clearance.

9. A device for producing plates with a recurring pattern of surface deformations from a loose noncoherent

mass of fibrous cellulosic material admixed with a binder, comprising a pair of complementarily profiled rotatable forming elements with juxtaposed endless compression surfaces defined by generally parallel generatrices and separated at their point of closest approach by a clearance substantially corresponding to the thickness of the plates to be produced; drive means for concurrently rotating said elements at identical peripheral speeds; guide means including said elements forming a gap of progressively decreasing width converging toward said clearance; hopper means ahead of said guide means for funneling a continuous supply of said mass directly into said gap; curing means beyond said point of closest approach for hardening a deformed plate formed by compaction of the funneled mass; said elements comprising a pair of endless flexible bands disposed substantially horizontally one above the other, the lower one of said bands having a surface projecting rearwardly beyond the upper band, said hopper means including a spreader disposed above said projecting surface for depositing said material thereon; said curing means comprising a press with a pair of heated platens displaceable parallel to said bands and provided with large transverse serrations facing in the direction of said gap for heating overlapping zones of a layer of said fibrous material compacted between said bands.

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