March 15, 1927. 1,621,147

P. E. WINNERTZ

MANUFACTURING HOLLOW BODIES FROM PULP FIBER

Filed June 22, 1925 3 Sheets-Sheet 1

Fig. 1.

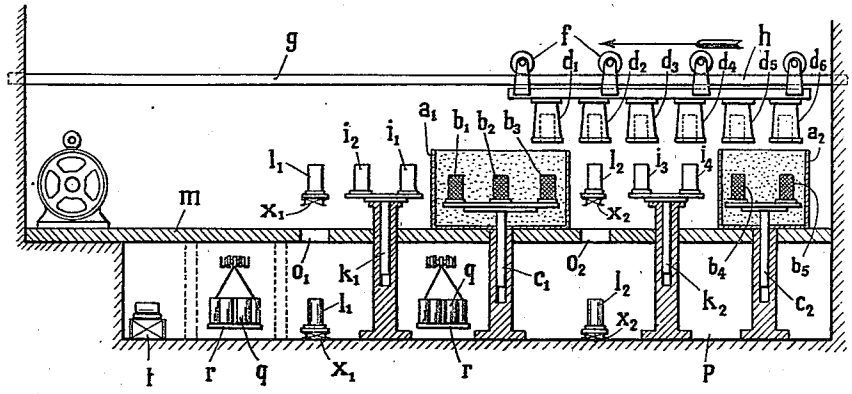
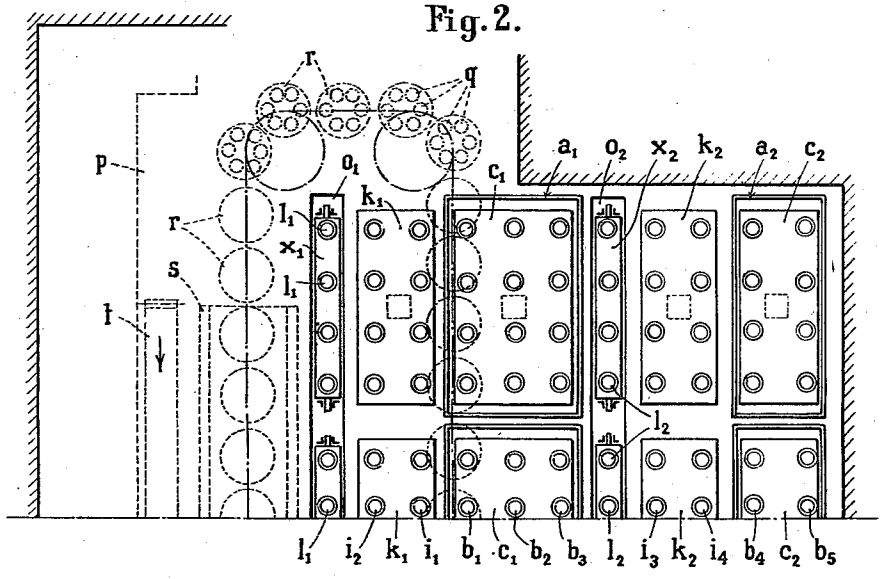


Fig. 2.



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Fig.3.

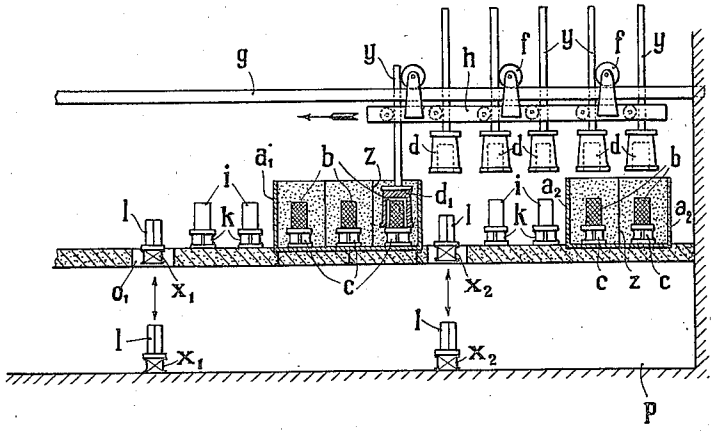
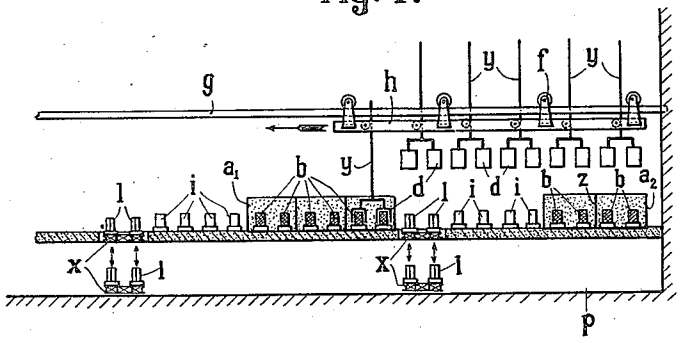


Fig.4.



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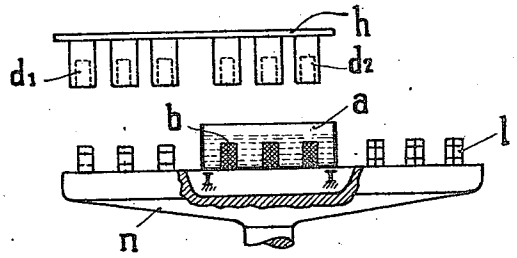
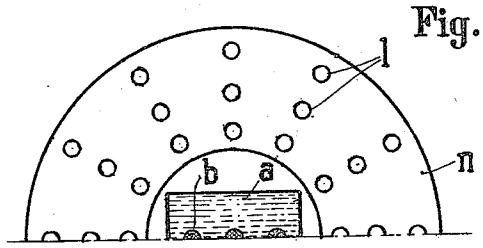


Fig.5.



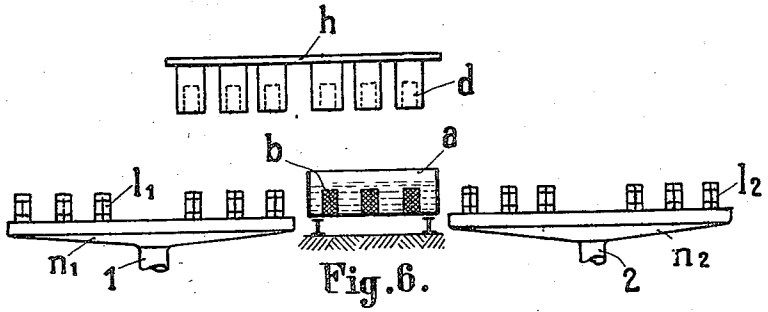
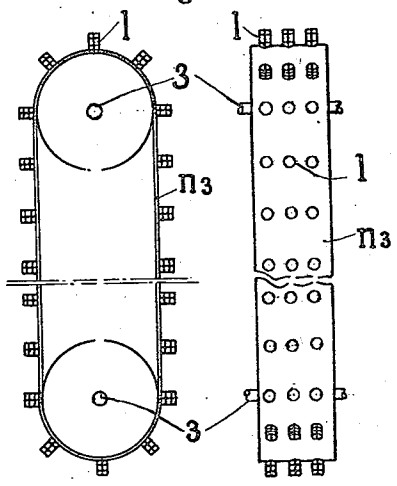


Fig.6.

Fig.7.



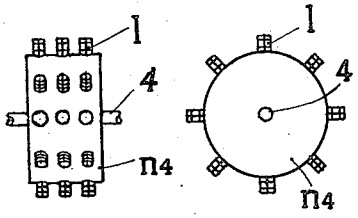


Fig.8.

Inventor:

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Patented Mar. 15, 1927. 1,621,147

UNITED STATES PATENT OFFICE.

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MANUFACTURING HOLLOW BODIES FROM PULP FIBER.

Application filed June 22, 1925, Serial No. 38,898, and in Germany February 16, 1924.

This invention refers to improvements in the manufacture of hollow bodies from paper pulp or, more strictly speaking, from fibers of pulp and in particular from the fibers contained in the fiber-carrying white water or effluvia from the pulp chests, the screens, the paper machine and other instrumentalities and stages in the pulp and paper making and treating processes. In accordance with my invention, couching moulds or aggregates thereof adapted for progressive movement, in accordance with the different stages of treatment or operation, are displaceably disposed above have a corresponding perforated or sieve-like mould of wire gauze or equivalent material. It is an object of this invention to improve the course of manufacture and to provide for a better and more complete utilization of the fibrous material even in the dilute state, as compared with the instrumentalities heretofore in use. Other objects and advantages will appear as the specification proceeds.

The invention will be described with particular reference to the accompanying drawings, showing by way of example and diagrammatically various forms of embodiments of the principle of this invention. In Fig. 1 an arrangement according to my invention is shown conventionally in longitudinal section; Fig. 2 is a plan view of the arrangement according to Fig. 1 with the upper moulds removed; Figs. 3 and 4 are longitudinal sections of two further examples of embodiments of this invention; Fig. 5 is a modification showing both front view and fractional plan view thereof; Fig. 6 is a front view of another modification; Figs. 7 and 8 are details to be referred to.

Referring particularly to Figs. 1 and 2 of the drawings, the arrangement and the mode of operation are substantially as follows:

After the pulp water chest a_1 in the beginning of the manufacturing process has been filled with pulp water, a layer of fibers is deposited in the well known manner by aspiration of air upon the row of sieve-like or wire-gauze moulds b_3 and the mould table c_1 is raised in the usual manner, for instance by hydraulic pressure, until the lower moulds b_3 have been moved into engagement with the upper moulds d_1 which happen to be above the moulds b_3 and in these upper moulds d_1 the layer of fibers is couched and retained. Thereupon the mould table c_1 for the lower moulds again descends into the pulp water container a_1, the row of lower moulds b_3 aspirates a fresh layer of fibers from the contents of the container a_1 which in the meantime or between the different stages of operation has been fed with a new charge of fiber-containing liquid; the mould table c_1 is again raised and enters the row of upper moulds d_1 and after the couching operation of a second layer of fibers upon the layer already contained in the upper row d_1 the table with the lower moulds is again lowered into the pulp water container a_1.

Thereupon the carriage h supporting the upper moulds in certain spaced relationship to each other and running with the wheels f upon the guide rails g is moved towards the row of sieve-moulds b_2 until the row d_1 of the uper moulds is centered above the row of lower moulds b_2. The pulp water container a_1 is fed at the same time; this feeding operation is preferably effected by automatic means. The rows b_3 and b_2 of lower moulds will now both aspirate layers of fiber, the mould table c_1 of the lower moulds is again raised in the manner herebefore described and a third layer of fibers is couched onto the two layers already contained in the row d_1 of upper moulds and by means of the row of lower moulds b_3 the first layer of fibers is transferred to the row of upper moulds d_2. After the descent of the mould table c_1 into the pulp water container which has been re-charged in the meantime and the aspiration of fresh layers of fibers onto the lower row of moulds b_2 and b_3 the cycle of operations is repeated in such a manner that a fourth layer of fibers is couched onto the three layers of fibers of the upper row d_1, and a second layer of fibers is couched onto the already existing first row of fibers in the upper row of moulds d_2. Thereupon the mould table c_1 with the lower moulds is again lowered into the pulp water container a_1. It will therefore be seen that now there are four layers of fibers in the upper moulds d_1 and two layers of fiber in the upper moulds d_2.

The carriage h with the upper moulds is now, preferably automatically, further displaced in the same direction until the row of upper moulds d_1 is substantially centrally disposed above the row of lower moulds b_1. From the pulp water container a_1 which

has been re-charged in the meantime all three rows of lower moulds b_3, b_2, b_1 mounted upon the moulding table c_1 aspirate fresh layers of fiber, as hereinbefore described, which are transferred in the manner referred to to the rows of upper moulds d_3, d_2, d_1 mounted thereabove. This cycle is repeated so that then there will be a totality of six layers of fibers superimposed in the row of upper molds d_1, four superimposed layers of fibers in the row of upper moulds d_2 and two layers of fiber in the row of upper moulds d_3. The carriage h of the upper moulds will now move in the same direction as heretofore, until the row of upper moulds d_1 has arrived above the row of pressing moulds i_1 of the pressing table k_1, while, at the same time, the row of upper moulds d_2 has arrived above the row of sieve-moulds b_1.

With the charge of pulp water filled up and supplemented, the tables of the sieve-moulds b_1, b_2, b_3 will then cooperate in the manner hereinbefore described with the rows of moulds d_2, d_3, d_4 above the same, while the row of pressing moulds i_1 by any suitable means, thus for instance by a hydraulic elevation of the pressing mould table k_1, is introduced into the row of upper moulds d_1, thereby squeezing and forcing out the excess of water from the six superimposed layers of fibers in said upper rows, for such a time until the layers of fiber have twice been formed in each of the rows of sieve-moulds b_1, b_2, b_3 and have been couched and transferred to the rows of upper moulds d_2, d_3, d_4 suspended thereabove. Upon the second descent of the sieve-mould table c_1 the pressing-mould table k_1 is also lowered into its initial position. Thereupon the carriage h with the upper moulds is advanced until the row of upper moulds d_1 has arrived above the row of pressing moulds i_2 of the pressing table k_1, and the mode of operation of the sieve-mould table c_1 and of the pressing-mould table k_1 will now proceed with the entire series of moulds in the manner described.

After the working tables c_1 and k_1 have been finally caused to descend, the carriage h advances the upper moulds upon the guide-rail g in the same direction, by which means the row of upper moulds d_1 has arrived above the lower moulds l_1 which may be raised and lowered by mechanical, electrical or hydraulic means or the like and the row of upper moulds d_6 has at the same time placed itself above the row of upper moulds b_3. Now, the formation of layers of fibers and respectively the squeezing and desiccation of the same in the upper moulds will take place simultaneously in the manner described and at the same time the sufficiently desiccated hollow bodies of pulp or paper may then be expelled from the upper moulds d_1 which, for this purpose, may be made extensible or laterally spread and are received by the lower moulds l_1, after, by means of the expelling table x_1, the lower moulds have been raised and introduced to a certain depth into the upper moulds d_1. As soon as the expelled hollow pulp or paper bodies have become disposed upon the lower moulds l_1, the working table x_1 descends with the same, thus for instance through an aperture o_1 in the floor or ceiling m unto the bottom of the drying room p. After this has been effected and after the working tables c_1 and k_1 have been again lowered with all the lower moulds mounted thereon, the carriage h with the upper moulds is returned to its initial position shown in Fig. 1 of the drawing, so that the now emptied row of upper moulds d_1 registers with the lower mould b_3, and the completely compressed and substantially desiccated row of upper moulds d_2 will register with the expelling table x_2 situated on the other side of the pulp water container a_1 and adapted to be lowered through an aperture o_2 of the floor or ceiling m. Also, the row of upper moulds d_3 with the semi-desiccated six layers of pulp will now be above the row of pressing moulds i_3 of the pressing table k_2, the row of upper moulds d_4 with the couched six superimposed layers of pulp above the row of pressing moulds i_4 of the pressing table k_2, the row of upper moulds d_5 with the four layers of pulp above the row of sieve-moulds b_4 of the sieve-mould table c_2 provided in the additional pulp chest a_2 and carrying for instance two rows of sieve-moulds, and the row of upper moulds d_6 with two superimposed layers of pulp will be situated above the rows of sieve-moulds b_5 of the sieve-mould table c_2.

The various steps of procedure of the formation of pulp layers or fiber layers for the feeding of the two chests or pulp water containers a_1, a_2 with pulp water and for the compression, squeezing and expelling of the hollow body of fibers, will now go on upon the righthand side of the device in accordance with Fig. 1 in the same manner as hereinbefore described.

After, in the course of this operation, each of the sets of sieve-moulds b_3, b_4, b_5 have produced in the upper moulds d_1, d_5, d_6 above the same two fresh layers of fiber and after the sufficiently expressed and desiccated hollow bodies of paper or pulp have been expelled from the upper moulds d_2 and have been taken up by the lower moulds l_2 and after the couched layers of fiber or pulp in the upper moulds d_3 and d_4 have been expressed by the rows of pressing moulds i_3 and i_4 of the compression table k_2 and the moulding tables c_1, x_2, k_2 and c_2 have descended again, the carriage h with the upper moulds is shifted so as to move in the direction towards the sieve-moulds b_2, as already described, and the course of operation proceeds in the same manner as heretofore

stated, thereby causing the moulding tables k_1 and x_1 to be successively operated again, while the moulding tables c_2, k_2 and x_2 are correspondingly arrested consecutively, until a new quantity of hollow paper bodies which have been sufficiently desiccated by squeezing are expelled from the upper moulds d_1 and are received by the lower moulds l_1, whereupon the carriage h is returned to its initial position shown in Fig. 1 of the drawing.

As appears from Fig. 3, the moulding machine may also be arranged in such a manner that the rows of upper moulds d on the carriage h may be so disposed as to be lowered and raised by mechanically, electrically or hydraulically operated gears and racks on the bars y to cooperate with the lower moulds b which are stationarily arranged in the pulp water chests or containers a with partitions z. The pressing-mould tables k with the pressing moulds i are likewise stationarily arranged in this exemplification, while the expelling tables x with the lower moulds l for the reception of the hollow bodies of paper, pulp or the like are only vertically reciprocated with relation to the drying chamber p. In all other respects the mode of operation of the rows of mould is similar to what has been described with reference to Figs. 1 and 2.

Fig. 4 is a diagram of an arrangement in which two interconnected rows of upper moulds d are operated simultaneously and correspond to double rows of lower moulds b, i, and l on the working tables. In this manner the efficiency of the plant may be further increased by increasing the amount of simultaneously operating rows of moulds.

In order to effect the drying, the hollow bodies of pulp or paper are manually removed from the expelling moulds l_1, l_2, according to Figs. 1 and 2, which have been lowered below the floor m and as far as the bottom of the drying chamber p; they are then mounted on the drying moulds q which may, for instance, be mounted on axially rotatable suspension cars r suspended from overhead rails or the like in the well known manner and with these may be slowly moved in succession by any suitable mechanical driving means through a drying channel heated with air or the like. The charging of the drying carriages is effected with comparative ease, because in the continuous operation of the moulding machine for such solid hollow bodies the same can be taken off simultaneously by several operators from the expelling moulds l_1 and l_2. At the discharging point of the drying channel s, indicated in dotted lines in Fig. 2, one or more workmen may take off the dried bodies from the drying moulds of the drying carriage r and transfer them upon an endless conveying apron t which is moved in the direction of the arrow (Fig. 2) and which carries the finished cups, vats, barrels or similar hollow bodies thus produced to the place of storage or of further treatment thereof.

With the arrangement according to Fig. 5, small hollow bodies of pulp or paper having thin walls are manufactured in such a manner that the upper moulds which are laterally displaceable with the supporting plate h and are adapted to be raised and lowered and of which two similar groups d_1 and d_2 are provided, will each receive simultaneously a layer of fibers which have been deposited upon the sieve moulds b in the pulp container tank a by aspiration in the well known manner. In the operating position of the plant shown in the upper part of Fig. 5 the group d_1 of upper moulds, for instance, has already been charged with a layer of pulp or paper, and upon the now occurring lowering of the upper moulds, the hollow bodies contained in the group of moulds d_1 are transferred to the drying mould l, which may, for instance, be effected by the spreading apart of the upper moulds and the pushing-off of the body, while, at the same time, the upper moulds d_2 receive a layer of fibers, paper, pulp or the like from the sieve-mould b. After this has been effected, the groups of upper moulds are again raised, the carrying plate is moved to the right until the set of moulds d_1 of the upper moulds will be in alignment above the sieve-moulds b, while the row of upper moulds d_2 is in exact alignment above the drying moulds l at the right-hand side of the device. Upon the descent of the upper moulds, the hollow bodies contained in the group d_2 of upper moulds are transferred to the drying moulds l therebelow and the previously emptied upper moulds d_1 receive a new layer of fibrous material. This cycle of operations is repeated over again, and, at the same, time, the carrying plate n with the drying moulds l is correspondingly advanced each time by rotating on its axis, so that a fresh group of drying moulds will always be placed under the upper moulds. The drying moulds l may, for instance, comprise metal cylinders heated by steam, hot air, by electrical means or the like. The drying may also be accelerated from the outside by a current of air which, if desired, may be specially heated. At the end of a complete rotation of the carrying plate n for the drying moulds l or, sometimes even earlier the ready dried hollow bodies are taken off from the drying moulds.

The modified arrangement shown in Fig. 6 is substantially distinguished from the arrangement shown in Fig. 5 by the fact that in Fig. 6 two rotating tables n_1 and n_2 with drying moulds l_1, l_2 rotatable on ver-

tical shafts 1 and 2, respectively, are provided on both sides of the pulp-water tank *a* with the sieve-moulds *b*. In other respects the mode of operation of the device is similar to those hereinbefore described.

In another modified arrangement of the invention shown in Fig. 7 the drying moulds *l* are disposed on an endless band or the like n_3 which is placed on two drums 3 with horizontally disposed rotating axes. In the further modification of the drum arrangement shown in Fig. 8, the drying moulds *l* are directly mounted upon a drum n_4 rotatable on a horizontal axis 4. Both of these arrangements make it possible for the ready dried hollow bodies to drop off automatically, if required, and upon any suitable conveying device, for instance.

Various other modifications and alterations are admissible within the scope and spirit of this invention, as will be governed by differing conditions of application, these being all comprised within the meaning of the claims hereunto appended.

I claim:—

1. The method of manufacturing hollow fiber-bodies and the like, which consists in causing spacedly and parallelly superimposed rows of supporting means and of receiving means to be laterally and axially moved into alignment with each other, immersing certain of the supporting means into fiber-carrying liquids, thereby depositing layers of fiber on said supporting means, superimposing and transferring a certain number of such layers in successive stages to the supporting means, and periodically advancing said supporting means in stages corresponding to the number of layers, transferred to them between each period of their movement, then moving the receiving means in the same direction into alignment with a set of unimmersed supporting means in successive stages, then engaging the layers-containing receiving means with the corresponding unimmersed supporting means and compressing the layers, detaching the compressed fiber-bodies from the receiving means, and receiving them upon other non-immersed supporting means, then returning the rows of receiving means to their initial position, and transferring layers of fibers to the now empty receiving means, and compressing and detaching the compressed layers of fibers in and from the remaining receiving means in successive stages.

2. The method of manufacturing hollow fiber-bodies and the like, which consists in immersing a certain number of supporting means in a fiber-containing liquid, thereby depositing layers of fibers on said supporting means, moving a plurality of spacedly disposed receiving means successively into alignment with said supporting means, periodically and superimposing and delivering layers of fibers from the suppporting means onto the receiving means, moving the completely charged receiving means past the supporting means, compressing the completely charged fiber-bodies obtained in successive stages, while simultaneously charging other receiving means, and detaching the fully compressed fiber-bodies, then returning the receiving means to their initial position in alignment with one of the fiber-depositing supporting means, and other receiving means into alignment with other supporting means, corresponding in number to the freely exposed first mentioned supporting means, momentarily unaligned with receiving means, then moving the supporting means in the first mentioned operative direction into alignment with the next following supporting means, and superimposing and depositing layers of fibers onto the receiving means, and respectively compressing and detaching the completed fiber-bodies obtained.

3. In a device of the kind described, a plurality of spaced supporting means, and a plurality of equally spaced receiving means in parallel spaced relation to the supporting means, means adapted to move the receiving and supporting means intermittently longitudinally and axially into successive operative engagement with each other and to return them to the initial position, fiber-containing tanks surrounding certain sets of supporting means, adapted to produce bodies of fibers in the receiving means, the unsurrounded supporting means serving as compressing and detaching means for the fiber bodies contained in the receiving means.

4. In a device of the kind described, a plurality of equally laterally spaced supporting means, a plurality of likewise equally spaced receiving means in parallel spaced relation to the supporting means and longitudinally reciprocable, means for axially moving the supporting and receiving means intermittently into successive axial alignment with each other, a main tank, surrounding a certain number of consecutively arranged supporting means, and other tanks surrounding a lesser number of consecutively arranged supporting means, and unsurrounded consecutively arranged supporting means on either sides of said tanks and adapted for the compression and detaching of the paper bodies from the receiving means, said tanks containing a supply of fiber-carrying liquid, and drying means for the completed fiber-bodies.

5. In a device of the kind described, a plurality of supporting means, a tank, adapted to contain fiber-carrying liquid, surrounding said supporting means, a plurality of spaced receiving means in parallel spaced relation to the supporting means,

means for moving the receiving means longitudinally and laterally of said supporting means, and means for moving the receiving and supporting means into axial engagement with each other, so as to produce a body of fibers in the receiving means, a supporting carrier, a plurality of compressing and detaching supports on said carrier and substantially flush with the other supporting means, and means to dry the detached, previously compressed fiber-bodies on the detaching supports.

In testimony whereof I affix my signature.

PETER ERNST WINNERTZ.