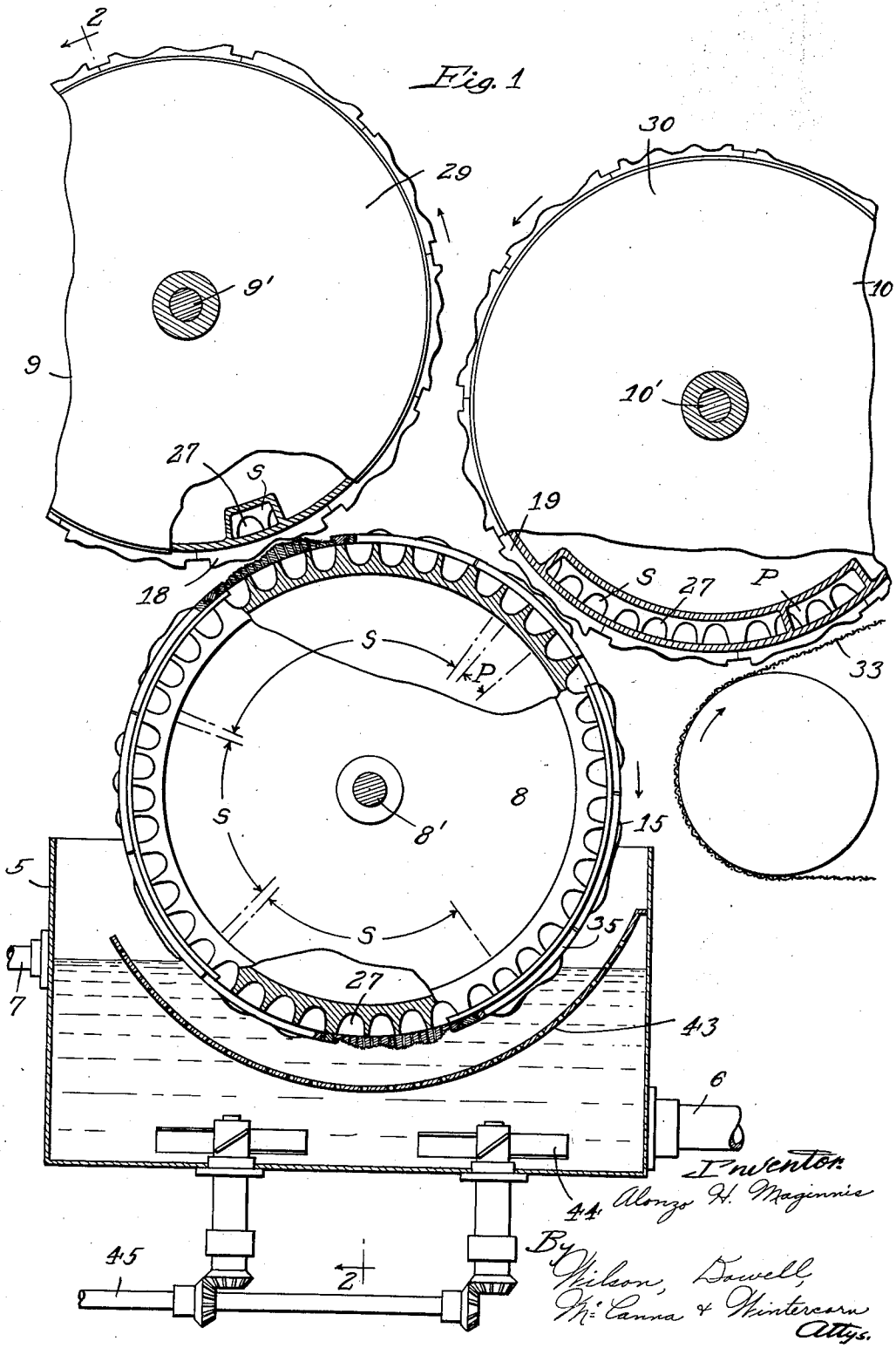
May 7, 1935. A. H. MAGINNIS 2,000,085

PULP MOLDING MACHINE

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Fig. 1



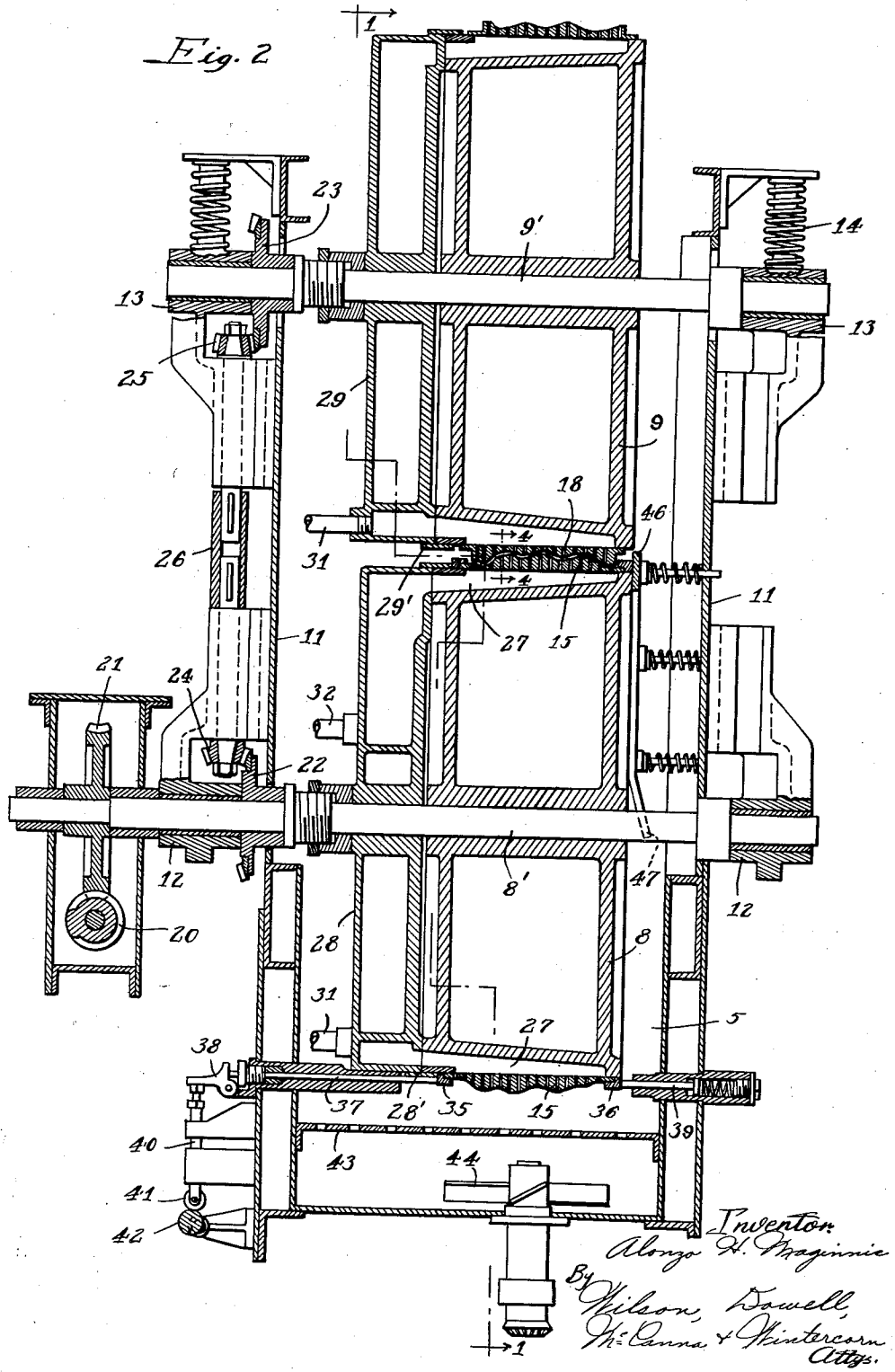
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PULP MOLDING MACHINE

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Fig. 2



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PULP MOLDING MACHINE

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Fig. 3

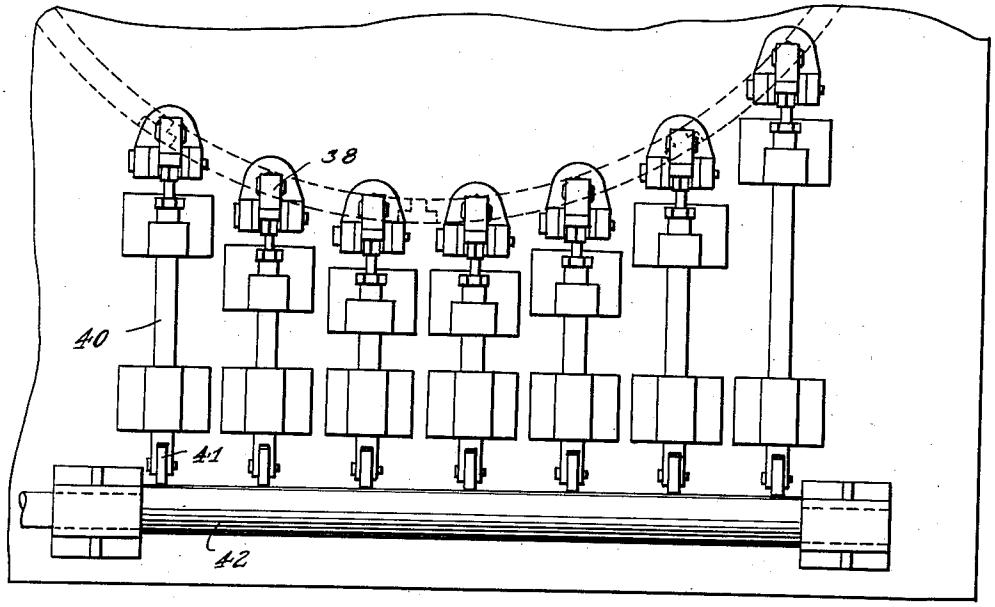
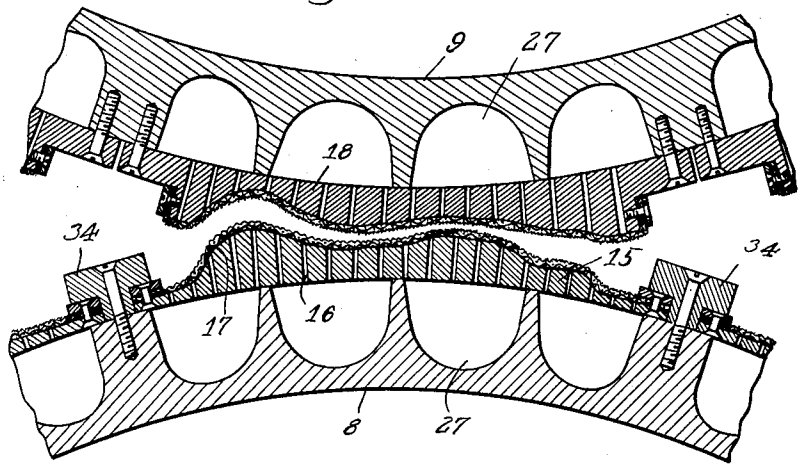


Fig. 4



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UNITED STATES PATENT OFFICE

2,000,085

PULP MOLDING MACHINE

Alonzo H. Maginnis, Rochelle, Ill.

Application January 5, 1934, Serial No. 705,333

11 Claims. (Cl. 92—56)

This invention relates to a machine for molding articles from pulp, and while the machine by a change in the form of the molds can be used for making a variety of articles, I have designed and constructed the same with a special view to suitability for molding relief pictures or placques.

Machines generally similar to the one herein disclosed have been devised in the past but embodied certain features which made them unsuited for higher class work, such as relief pictures or placques, wherein it is obviously important that the machine be capable of producing predetermined configurations and fine details faithfully in conformance to the perforated mold or pattern plate. Earlier machines along this general line were, as a rule, suitable only for flat work or work of extremely simple and crude pattern, such as egg crate fillers and the like.

One of the principal objects of my invention is to provide a machine in which the perforated pattern plates on the forming drum are subjected to vibration while immersed in the pulp solution with a view to getting a more even application of pulp and a closer and firmer interlocking of fibers, so that the pulp applied will not have so much water content to be consequently removed, and so that the pulp applied will follow the contour of the pattern more faithfully to show up every detail. In conjunction with this forming drum improved as just stated, I have also provided a perforated distributor plate in the vat of pulp solution and agitating means below this plate with a view to having the desired uniformity in the pulp material that is applied to the pattern, and thus further improve the grade of product.

Another object consists in the provision of two other drums of the same diameter as the transfer drum, the one an extracting drum and the other a transfer drum, both fitted with plates to match the pattern plates of the forming drum so that in the turning of these drums at the same speed with the forming drum, the plates on the extracting drum register with the proper plates on the forming drum to extract excess moisture and press the product for better detail, and thereafter the plates on the transfer drum register with the proper plates on the forming drum to remove the products. With this combination, I am enabled to use a series of patterns of the same or different designs, whereas, in previous machines there was the limitation to working only with one pattern. The machine embodies suitable guides in connection with the movable, vibratory plates on the forming drum for insuring accurate registration of these plates with the companion plates on the other two drums.

Still another object consists in the application of suction from within the forming and extracting drums during the wringer operation for the expulsion of water from the pulp, whereby to remove as much moisture as possible by the combined action of suction and compression.

The invention is illustrated in the accompanying drawings, in which—

Figure 1 is a vertical, longitudinal section through a machine embodying my invention, the section being taken on the broken line 1—1 of Fig. 2;

Fig. 2 is a vertical section in a transverse plane taken on the line 2—2 of Figure 1;

Fig. 3 is an enlarged detail in side elevation of the lower portion of Fig. 2, and

Fig. 4 is an enlarged sectional detail of the line 4—4 of Fig. 2.

The same reference numerals are applied to corresponding parts throughout the views.

Referring to Figure 1, the numeral 5 designates a vat containing pulp solution delivered through a pipe 6 in sufficient amount to maintain the level indicated, there being an overflow at 7 for withdrawal of any excess. 8 is the forming drum, 9 the extracting drum, and 10 the transfer drum. These drums are carried on shafts 8', 9' and 10', respectively. Portions of the frame of the machine are indicated in Fig. 2 at 11. Bearings 12 are provided on the frame for the shaft 8' supporting the forming drum 8 so that its lower portion is immersed in the pulp solution approximately to the extent appearing in Figure 1. Other bearings, not shown, are provided on the frame for the shaft 10' to support the transfer drum 10 above and forward with respect to the forming drum 8. The bearings 13 for the shaft 9' are preferably movable under action of the springs 14 to support the extracting drum above and slightly to the rear with respect to the forming drum 8, while maintaining a given pressure between the plates on the peripheries of drums 8 and 9 for the purpose of wringing out moisture from the pulp deposited on the pattern plates on the forming drum 8. The pattern plates or molds on the forming drum 8 are indicated by the numeral 15. These are perforated, as indicated at 16 in Fig. 4, and profiled on their exposed face, as at 17, according to the shape or pattern of the product to be molded. The plates 18 and 19 perforated similarly to plates 15, are profiled to match the plates 15, the plates 18

being mounted on drum 9 and the plates 19 on drum 10 in the proper order and positions to register accurately with the plates 15 in the turning of the three drums. The drums are all of the same diameter and driven at the same speed, preferably one half or more turn per minute, and will be equipped with plates all of one pattern or a number of patterns. It is thought to suffice so far as a showing of the drive for the drums is concerned to show a power operated worm 20 (Fig. 2) transmitting drive to a worm wheel 21 fixed on shaft 8', and bevel gears 22 and 23 fixed on shafts 8' and 9' meshed with bevel pinions 24 and 25. A similar power take-off will, of course, be provided for the shaft 10'. The sleeve 26 is splined for a sliding driving connection with the two shafts attached to the pinions 24 and 25 so that the shaft 9' is free to "float" sufficiently to have the pressure of the springs 14 active in the engagement of the plates 18 with the plates 15. The drums are all recessed in the periphery thereof under the plates to provide chambers, as indicated at 27, to subject the plates 18 to suction and plates 15 and 19 to suction or compression. Manifolds 28, 29 and 30 having suction and pressure chambers therein are disposed alongside the drums 8, 9 and 10, respectively, and are coaxial and stationary with respect thereto. The suction chambers in these manifolds have suction pipes connected therewith, as shown at 31; the pressure chambers have air pressure pipes connected therewith as at 32. There are flat side faces on the drums to ride on flat side faces on the manifolds so as to provide for communication of chambers 27 in the drums with the suction and pressure chambers in the manifolds, and circular bands such as those indicated at 28' and 29' in Fig. 2, are fixed either on the periphery of the drums or on the periphery of the manifolds, as preferred, overlapping the joints therebetween to more effectively seal said joints. In Figure 1, the letters S and P are used to indicate the angularity of movement of the forming drum through which the chambers 27 are subject to suction or pressure. 10'' suction is considered ample for the purpose of securing application of the pulp to the pattern plates but I prefer to have greater suction, say 15'', in the extraction operation where the plates 15 cooperate with the plates 18. The operation of the machine is, in a general way, readily apparent from a study of Figure 1: The pulp is sucked onto the pattern plates 15 as the vibrating plates pass through the pulp solution; suction is continued thereafter to draw out excess moisture, and, of course, insure keeping the covering of pulp on the pattern plates; then as the plates 15 come into register with plates 18 of the extracting drum 9, the pulp covering constituting the partially completed molded product is subjected not only to mechanical compression similar to a wringer action but there is increased suction applied both from above and below through plates 18 and 15 to withdraw the major portion of whatever moisture is expelled, the product being at the same time pressed to a cleaner cut configuration to more faithfully follow the profile of the pattern plate 15; then the molded product is soon thereafter subjected to air pressure from below through plates 15 and suction from above through plates 19 as these plates come into register, resulting in the transfer of the product onto the plate 19 of the transfer drum 10, and soon thereafter the product, which by this time is in a condition so that it will not get out of shape readily, is subjected to compressed air through the plate 19 in order to discharge the product onto a suitable conveyor belt 33 which conducts the product to a receiving station so that the final drying out can be attended to. It is, of course, quite an advantage to have the machine equipped with drums of the same size so that one is not limited to the making of a single pattern but may, if desired, produce a variety at one time.

The character of the product is greatly improved in accordance with my invention by having the plates 15 vibrated as they are passed through the pulp solution for coating with pulp, and to have the pulp solution at the same time maintained in a certain degree of agitation. These things, taken together, insure not only a more uniform application of pulp to the pattern and hence a more accurately fashioned product, but also a product in which the pulp fibers are more closely knitted together and interlocked or interwoven, so that the resulting product is sturdier and will retain its shape indefinitely. Referring to Figs. 2–4, the plates 15 are slidable transversely on the periphery of the forming drum 8 between T-shaped guide rails 34. Arcuate end rails 35 and 36 of angular cross-section are suitably secured to the ends of the plates to vibrate or reciprocate with them. A series of push rods 37 actuated by tappets 38 are given impulses toward movement of the plates 15 to the right (Fig. 2) against the action of spring pressed plungers 39 at the other end of the plates. The tappets are operated by push rods 40 which have followers 41 riding on the periphery of an eccentric 42 suitably driven either from the same power source as the worm 20 or a separate source, as desired. There are sufficient tappets 38 and push rods 37, as shown in Fig. 3, and of course, sufficient cooperating plungers 39 to take care of the vibration of the plates 15 throughout the travel of the plates through the pulp solution in the vat 5. A perforated distributor plate 43 is disposed in spaced relation to the periphery of the forming drum 8 in the vat 5 and preferably formed concentric with the drum 8 so as to have the same spaced relation to the periphery thereof at all points in the vat. Below this plate are one or more propellers 44 suitably driven from a shaft 45 in the manner indicated to keep the pulp solution agitated so that there will be no tendency for heavier particles to settle but be impelled with the rest of the solution upwardly through the holes in the plate 43 toward the pattern plates 15. The plate 43 causes the rising column of solution to spread out and thus distributes the pulp solution more or less uniformly throughout that portion of the area of the periphery of the drum immersed in the solution, so that the pattern plates will be evenly coated. The mobility of the plates 15 to enable vibration thereof requires the provision of guide means for bringing the plates 15 into register with the plates 18 and 19 on the other drums, in the event they happen to be shifted out of alignment when they leave the vibrating means 37—39. I prefer to utilize the band 28' as a guide at one end of the plates 15; if the plates 15 have their pieces 35 in abutment with the band 28' they are properly registered with the plates 18 and 19, assuming, of course, that the drums 8, 9 and 10 are mounted and maintained in proper alignment and indexed relationship. An arcuate guide 46 has engagement with the pieces 36 at the other end of the plates 15 and is spring pressed toward engage-

ment with the flat side of the drum 8, whereby to insure accurate alignment of the plates on the drum 8 and thus insure their accurate registration with the plates 18 and 19 on the other two drums. One end of the guide 46 is bent outwardly away from the side of the drum 8, as shown at 47, so as to afford an opportunity for any plate 15 which may be projecting slightly to ride back into alignment, after which the same will, of course, be kept in alignment by the guide as the drum turns relative thereto. The flat face of the guide may, if desired, be provided with suitable anti-friction rollers to reduce the drag upon the turning of the drum 8 relative thereto.

It is believed the foregoing description conveys a good understanding of the objects and advantages of my invention. The appended claims have been drawn with a view to covering all legitimate modifications and adaptations.

I claim:

1. In a machine of the class described, a forming drum having a molding plate with a predetermined profile, means for depositing pulp in wet plastic condition thereon, means for subjecting the molding plate to vibration relative to the drum while the pulp is being deposited thereon, an extracting drum having a wringer surface profiled to match the profiled surface of the molding plate to subject the coating of pulp to compression between said surfaces to eliminate moisture therefrom and conform the pulp to the profile of the molding plate, means for moving the molding plate on the forming drum into alignment with the surface on the extracting drum prior to registration therewith, and means for transferring the molded product from the molding plate.

2. In a machine of the class described, a forming drum having a perforated molding plate with a predetermined profile thereon, suction means for depositing pulp in a wet plastic condition on the molding plate while immersed in pulp solution, means for vibrating the molding plate relative to the drum while the pulp is being deposited on the plate, an extracting drum disposed with its periphery in alignment with that of the forming drum and having a profiled surface to match the profiled surface of the molding plate and arranged to apply pressure to the pulp deposit so as to eliminate moisture therefrom and conform the pulp to the profile of the plate, means for moving the plate relative to the drum into alignment with said surface prior to registration therewith, and means for transferring the molded product from the molding plate.

3. In a pulp molding machine of the type comprising a rotary drum turning with a portion thereof immersed in pulp solution for the depositing of pulp on a molding surface on the drum by suction, a molding plate on the periphery of said drum having a molding surface and mounted for sliding movement transversely on the periphery of the drum, and means for subjecting the plate to vibratory motion during its immersion in the pulp solution.

4. In a pulp molding machine of the type comprising a rotary drum turning with a portion thereof immersed in pulp solution for the depositing of pulp on a molding surface on the drum by suction, a molding plate on the periphery of said drum having a molding surface and mounted for sliding movement transversely on the periphery of the drum, and means for reciprocating said plate during one portion of a rotation of the drum which includes passage of the plate through the pulp solution.

5. In a pulp molding machine of the type comprising a rotary drum turning with a portion thereof immersed in pulp solution for the depositing of pulp on a molding surface on the drum by suction, a molding plate on the periphery of said drum having a molding surface and mounted for sliding movement transversely on the periphery of the drum, means for reciprocating the plate relative to the drum throughout one portion of a revolution of the drum so that the plate is vibrating while passing through the pulp solution, and means for holding the plate in a predetermined position of registration on the periphery of the drum throughout the balance of the revolution.

6. In a pulp molding machine, the combination of a receptacle for pulp solution, a molding drum turning so that a portion thereof is immersed in the pulp solution, the drum having suction means for the application of pulp to the periphery thereof, a peripheral molding plate on said drum having a molding surface on which the pulp is deposited by suction, means for vibrating the plate relative to the drum during the depositing of pulp, and pulp agitating and distributing means for simultaneously impelling the pulp toward the plate and uniformly distributing the pulp throughout the area thereof.

7. In a pulp molding machine, the combination of a receptacle for pulp solution, a molding drum turning so that a portion thereof is immersed in the pulp solution, the drum having suction means for the application of pulp to the periphery thereof, a peripheral molding plate on said drum having a molding surface on which the pulp is deposited by suction, and means for reciprocating the plate transversely relative to the drum during the depositing of pulp, a perforated distributor plate disposed in the pulp solution in spaced relation to the molding plate, and agitator means in the pulp solution for impelling pulp through the distributor plate toward the molding plate so as to uniformly deposit pulp thereon.

8. A pulp molding machine, comprising a receptacle for pulp solution, a forming drum turning so that the lower portion is immersed in the pulp solution, an extracting drum and a transfer drum disposed over the forming drum and turning at the same peripheral speed, mold plates slidably mounted on the periphery of the forming drum for transverse movement with respect thereto, said plates being perforated and having a molding surface of a predetermined form, companion plates fixed on the periphery of the other drums also perforated and having surfaces to match the molding surfaces of said plates, suction means for the forming drum to deposit pulp solution on the molding plates and thereafter extract moisture from the pulp deposit, suction means for the extracting drum to withdraw moisture during the compression of the pulp deposit between the plates on the extracting drum and the molding plates on the forming drum, suction means for the transfer drum to transfer the molded product from the molding plates to the companion plates on the transfer drum, means for reciprocating the molding plates during the immersion thereof in the pulp solution, and means for moving said plates into alignment with their companion plates for holding the same in such alignment throughout their

travel past the companion plates on the extracting and transfer drums.

9. A machine as set forth in claim 8 including agitating means in the pulp receptacle for impelling pulp toward the forming drum, and a perforated distributing plate disposed between the drum and the agitating means.

10. A machine as set forth in claim 8 wherein the means for reciprocating the molding plates comprises a plurality of push rods disposed in parallel relationship and arranged in an arc adjacent the lower portion of the forming drum to communicate movement in one direction to the molding plates throughout the travel of said plates in the pulp solution, spring means normally tending to move the plates in the other direction, and means for communicating impulses to the push rods.

11. In a machine of the class described, a forming drum having a perforated molding plate with a predetermined profile thereon on which pulp in a wet plastic condition is arranged to be applied by suction through the plate while the plate is immersed in pulp solution, an extracting drum having a perforated wringer plate profiled to match the profile of the molding plate, means for resiliently urging the drums toward each other so that pulp applied to the molding plate is compressed between said plate and the wringer plate, and means for simultaneously exerting suction through both of said perforated plates for withdrawal of the moisture expelled in the compression of the pulp.

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