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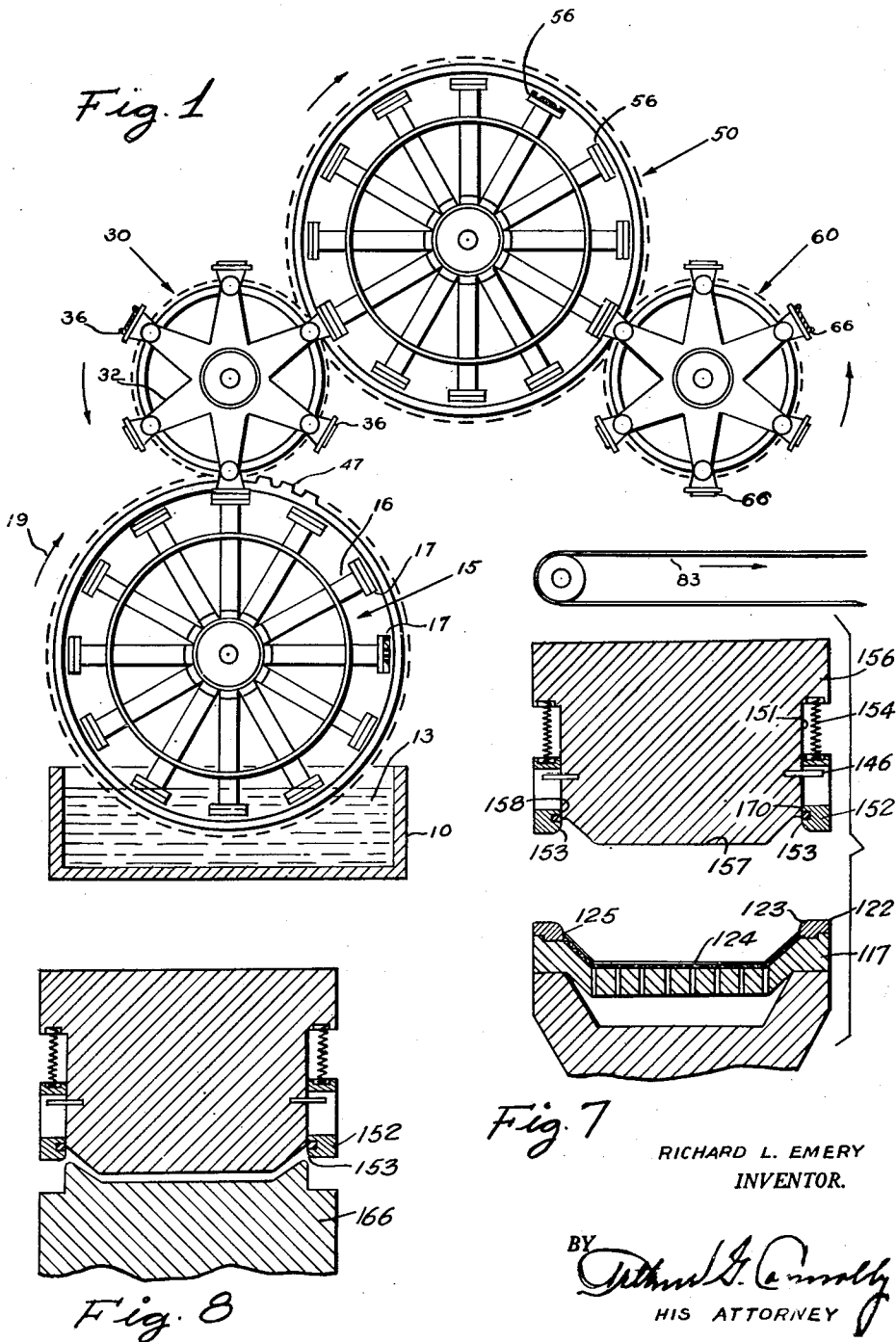
R. L. EMERY

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REDUCTION OF EDGE FLASHING ON MOLDED PULP ARTICLES

Filed Nov. 19, 1951

3 Sheets-Sheet 1



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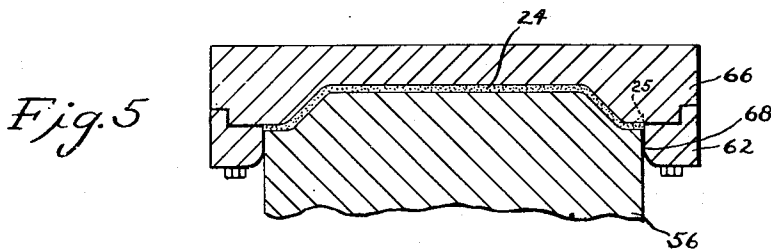
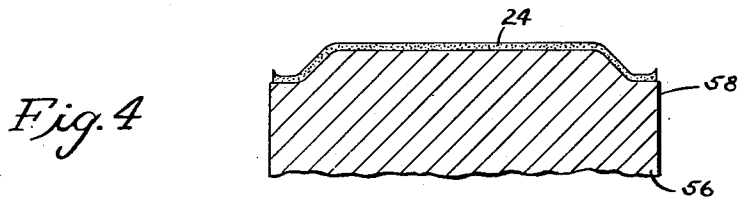
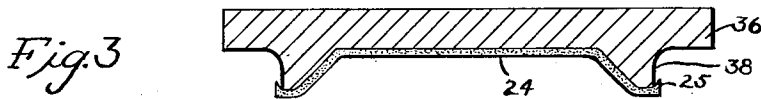
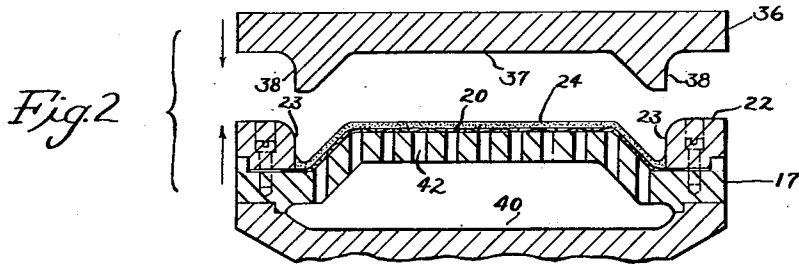
R. L. EMERY

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3 Sheets-Sheet 2



RICHARD L. EMERY
INVENTOR.

BY *Richard L. Emery*
HIS ATTORNEY

Dec. 4, 1956

R. L. EMERY

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REDUCTION OF EDGE FLASHING ON MOLDED PULP ARTICLES

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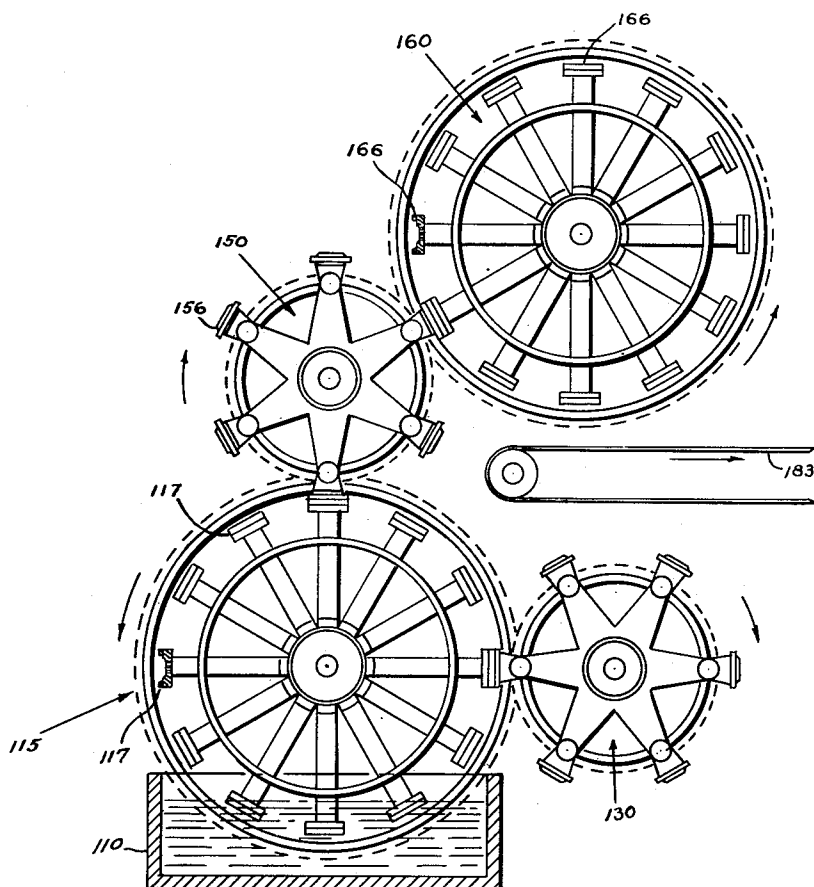


Fig. 6

RICHARD L. EMERY
INVENTOR.

BY *Arthur J. Kennedy*
HIS ATTORNEY

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REDUCTION OF EDGE FLASHING ON MOLDED PULP ARTICLES

Richard L. Emery, Waterville, Maine, assignor to Keyes Fibre Company, Portland, Maine, a corporation of Maine

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4 Claims. (Cl. 92—56)

The present invention relates to the manufacture of molded pulp articles and particularly to the type of manufacture which tends to form these articles with excess marginally projecting fibrous material commonly called edge flashing.

In normal pulp molding operations a mass of wet fibers is formed from a fibrous slurry on a perforated forming surface of a suction forming die and then compacted while still quite wet between this forming surface and a cooperating die having a mating compacting surface. These dies are provided with closely fitting marginal aligning guides to assure proper mating and to also act as peripheral stops restricting the squeezing out of the compacted pulp from the margins of the formed mass. After some use, these marginal guides become worn or marred, permitting the escape of some of the pulp mass from the margins during the compacting. This is the usual way in which edge flashing is formed.

When such flashing appears on the finished articles during a manufacturing run, it has been necessary to apply flash removal operations to these articles, a not very satisfactory procedure, or else replace the dies, a highly expensive procedure.

Among the objects of the present invention is the provision of new and improved methods and apparatus for avoiding the above difficulties.

The above as well as additional objects of the present invention will be more clearly understood from the following description of several of its exemplifications, reference being made to the accompanying drawings wherein:

Fig. 1 is a diagrammatic side view with parts broken away showing the essential details of one type of pulp molding apparatus exemplifying the invention;

Figs. 2, 3, 4 and 5 show enlarged detail views illustrating the steps in the operation of the machine of Fig. 1; and

Figs. 6, 7 and 8 are views similar to Figs. 1, 2 and 5 showing a modified embodiment of the present invention.

According to the present invention a molded pulp article is made by first forming a wet mass of fibers from a fibrous slurry on a forming surface of a first die having the approximate shape of the desired article, compacting the wet mass of fibers by compressing them between the forming surface and a second die having a cooperating similarly shaped compacting surface, said dies also having peripheral guide elements extending generally in the compressing direction to guide these surfaces together and orient any edge flashing formed by the compression, then further compacting the fibrous mass between mating surfaces of dies guided together by peripheral guide elements directed oppositely to the first-mentioned guide elements to return said edge flashing to the body of the mass.

In the apparatus of Figs. 1 to 5 inclusive a tank 10 is arranged to hold a slurry of pulp 13 from which the desired article is to be produced. A turret assembly 15 carrying a plurality of radially disposed arms 16, each

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provided at its outer end with a forming die 17, is arranged to rotate and carry these forming dies through the slurry as by rotation in the direction of the arrow 19. As shown by the partially broken away view of one of these forming dies, a generally dish- or cup-shaped perforated forming surface is provided in this embodiment of the invention.

A second turret 30 having a plurality of arms 32, each carrying a compacting die 36 with a compacting surface that mates with the forming surface of die 17, is arranged to rotate with turret 15 and bring its successive dies 36 into pressing engagement with the respective forming dies 17. The pulp layer that deposits on the forming dies in tank 10 is thereby compacted and with the assistance of suction applied to the compacting dies 36, and/or compressed air on the forming dies, the compacted pulp is transferred to the compacting dies.

A third turret 50 similarly carries a third set of radially disposed dies 56 that mate with and are carried into transfer relation with the successive compacting dies 36. The compacted pulp masses are thereby transferred to the dies 56 in the manner indicated above.

An additional pressing or compacting stage is provided by a fourth turret 60 carrying suitably shaped pressing dies 66 and also suitably engaging with the successive transfer dies 56. The molded mass is again transferred in this pressing operation to a die 66 so that it is carried around until it is in a position to be deposited on a conveyor belt 83 on which it can be carried through subsequent treatments such as drying.

The various turrets are driven either intermittently or continuously by suitably synchronized drive structure schematically indicated as by the gears 47. At the same time connections are supplied for the application of forming and water draining suction, compressed air, heat as by electric lines, etc. One convenient arrangement for such connections is indicated in the Chaplin Patent No. 2,163,585 granted June 27, 1939, which patent also includes a more complete description of a commercially practicable form of construction for the individual turret coating features of the machine of Fig. 1.

The various steps in the molding process of the apparatus of Fig. 1 is more clearly set forth in Figs. 2 to 5 inclusive. As shown in Fig. 2, fibrous layer 24 deposits on forming die 17 over the forming surface defined by exposed screening 20 and is bounded by a die ring 22. This formation results from the application of suction through conduit 40 and perforations 42 to suck the fiber-suspending liquid from the slurry through the perforations 42, trapping the fibers on the screen 20. Compacting die 36 having a compacting surface 37 corresponding in shape to that of the forming surface 20 is provided with a peripheral cut-away guide wall 38 which coacts with a corresponding wall 23 of the die ring 22 to guide the compacting die into mating engagement with the forming die 17. In Fig. 2 the dies are shown as they are moving into compacting engagement. After the compacting is completed and the dies are separating, the fibrous layer 24 is transferred and adheres to the compacting die as indicated in Fig. 3. As more fully explained in the above-mentioned Chaplin patent, this transfer can be effected by terminating the application of suction to die 17 and substituting compressed air. Where edge flashing occurs, the edge of the fibrous layer 24 extends up along the guide surface 38 as shown in somewhat exaggerated form at 25.

In the next transfer operation the pulp layer 24 is deposited on transfer die 56 which is shown in Fig. 4 as having a peripheral guiding surface 58 extending in a direction opposite to that of the corresponding guide surfaces 23 in the forming die 17. Fig. 5 illustrates the pressing engagement of the transfer dies 56 with the

pressing dies 66. Here a die ring 62 is shown as carried by the pressing die so as to present a guide surface 68 also extending in the direction opposite to that of guide surface 38 in die 36. As a result the pulp layer 24 has any flash 25 returned to the body of the layer. At the completion of this pressing operation, when the molded article is deposited on conveyor 83, there usually is no appreciable amount of flashing or other irregularities at the edges of the pulp layer.

The dies 36, 56 and 66, although shown in imperforate form, may, if desired, be provided with perforations such as those shown at 42, with or without covering screen 20. Alternatively, the pulp engaging surfaces of any or all of the dies may merely be grooved or perforated or provided with other forms of drain passages such as those shown in the Sheffield Patent No. 1,984,384 granted December 18, 1934, or the Louisot Patent No. 2,129,697 granted September 13, 1938. In general, it is preferred that each compacting step be performed between dies at least one of which is provided with adequate drain passages to assist in removing additional liquid from the wet fibrous layer.

The apparatus shown in Fig. 6 illustrates a modified form of the present invention. In this construction a forming turret 115 carrying forming dies 117 has its lower portion immersed in a pulp slurry tank 110, and coacts with both a compacting turret 130 and a transfer turret 150. By proper adjustment of the forming suction for example the formed pulp layer is arranged to remain on the forming dies 117 of turret 115 through the compacting step, and until engagement with the transfer dies 156 on turret 150. On the transfer dies 156 the formed pulp layer is subjected to a pressing by pressing dies 166 on turret 160 onto which they are transferred. After this transfer, the pulp articles are unloaded on a conveyor belt 183 for subsequent treatment.

In this form of the invention the pulp layer as shown at 124 in Fig. 7 after the compacting by turret 130, is still retained on the forming dies 117 and may have the edge flashing 125 abutting die ring 122 at its guide surface 123. The transfer dies 156 are shown as provided with retractable die rings 152. These rings can be slidably fixed around a recessed step 151 at the periphery of transfer surface 157, and are normally held in the outwardly projecting position shown, as by springs 154 to provide an inner guiding surface 153. Slots 148 in the ring are engaged by pins 146 which may be secured to the body of the die to keep the die ring in place. When transfer die 156 is brought into face-to-face engagement with a forming die 117 the retractable guide ring 152 is engaged by the non-retractable ring 122 on the forming die and slid back by it until the pulp-holding surfaces are in proper juxtaposition. This retraction exposes an outer guide surface 158 at the margins of the transfer surface 157 for guiding engagement with guide walls 123 of the forming die. The pulp layer is now transferred as by means of suitably applied suction and/or compressed air, to the transfer surface 157.

When the transfer dies 156 are brought into engagement with pressing dies 166 on turret 160, the retractable die ring 152 is back in its projecting position as indicated in Fig. 8. In this position the guide surfaces 153 coact with corresponding guide walls 168 on the pressing dies to effect the flash returning pressing step similar to that shown above in connection with Fig. 5. To better hold the retractable guide ring in proper guiding position, it may be locked in place during this pressing stage as by means of a set of stop plungers brought up behind it by a suitably shaped cam carried by the shaft on which the turret rotates.

If desired a wiping or sealing ring 170 of resilient material such as rubber or steel can be fitted along inner guiding surface 153 or along outer guiding surface 158 to cooperate with and seal against the opposing guide surface for the purpose of assuring that a minimum of

pulp fibers find their way between these surfaces. Where a rubber sealing ring is used it is advantageously vulcanized in place to securely anchor it.

Instead of having the compacting stage in the apparatus of Fig. 6 separate from the transfer stage where the pulp layers are deposited on the dies of turret 150, these stages can be combined so that they both take place by coaction of dies 117 and 156, and turret 130 can then be omitted. In either of these forms of the invention the various dies can have drain passages as described above in connection with the construction of Fig. 1.

Where it is desired to have a screen surface covering on dies not provided with a fixed marginal die ring, the margin of the screen can be fastened to the face of the die by anchoring it with removable bars recessed in a groove cut into the face as near to the marginal wall as practicable.

As many apparently widely different embodiments of this invention may be made without departing from the spirit and scope hereof, it is to be understood that this invention is not limited to the specific embodiments hereof, except as defined in the appended claims. Thus, although the guide walls are shown above as generally prism-shaped, that is substantially parallel to the die movement, they can also be tapered to an appreciable extent as for example to act as centering elements for excessively misaligned die holders. In addition, the turrets of the apparatus of Figs. 1 and 6 can be oriented in different arrangements without affecting their function. By way of example, the construction of Fig. 1 can have its final turret 60 arranged to only compact the pulp masses on turret 50 without having the masses taken off this turret. The final unloading can then be made directly from turret 50 on to a conveyor suitably positioned. The above modification is readily made by merely shifting the engagement between turrets 15 and 30, in the clockwise direction with respect to turret 15, and/or correspondingly shifting the engagement position between turrets 30 and 50. This provides more room under turret 50, particularly under the lefthand portions of this turret where the turret 60 can be positioned. The turret 50 will then be arranged for unloading from below its righthand portions, with all turrets rotating in directions opposite to those indicated in Fig. 1.

As further modifications of the invention, the flash-reducing treatments described above can also be applied in the preparation of molded pulp articles that are substantially or completely dried while held in a mold or pressed between two molding dies.

What is claimed is:

1. A pulp fiber molding apparatus comprising a movable forming die, said forming die being movable into and out of a fiber pulp slurry bath wherein a mass of fibrous pulp is deposited on said forming die, said forming die being movable into a compacting station, a movable compacting die at said compacting station, said compacting die being constructed and arranged to contact said forming die and to compact the mass of fibrous pulp on said forming die, said forming die and said compacting die having complementary die faces, a movable pressing die at a second station, transfer means arranged to move said mass of fibrous pulp, after being compacted, toward the pressing die at said second station, said pressing die having a peripheral portion radially outward of its die face which is substantially complementary to the corresponding peripheral portion of said compacting die, the peripheral portion of said pressing die being constructed and arranged to snugly embrace the corresponding peripheral portion of said compacted mass, when said pressing die and said mass are in operative position, to press any upstanding portions of said mass back into the body thereof.

2. The apparatus of claim 1 wherein said forming die, pressing die and compacting die are each mounted for rotation on adjacent turret assemblies.

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3. The apparatus of claim 1 wherein said means arranged to move said mass of fibrous pulp toward the pressing die comprises a movable transfer die arranged to move in timed relationship with said pressing die and said compacting die.

4. The apparatus of claim 1 wherein said means arranged to move said mass of fibrous pulp toward the pressing die comprises a rotatable turret assembly upon which said forming die is mounted, said mass being movable by said forming die from said pressing die to said compacting die.

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