

July 11, 1939.

W. WARD

2,165,671

APPARATUS FOR MANUFACTURING PLASTIC ARTICLES

Filed Nov. 2, 1936

2 Sheets-Sheet 1

Fig. 1.

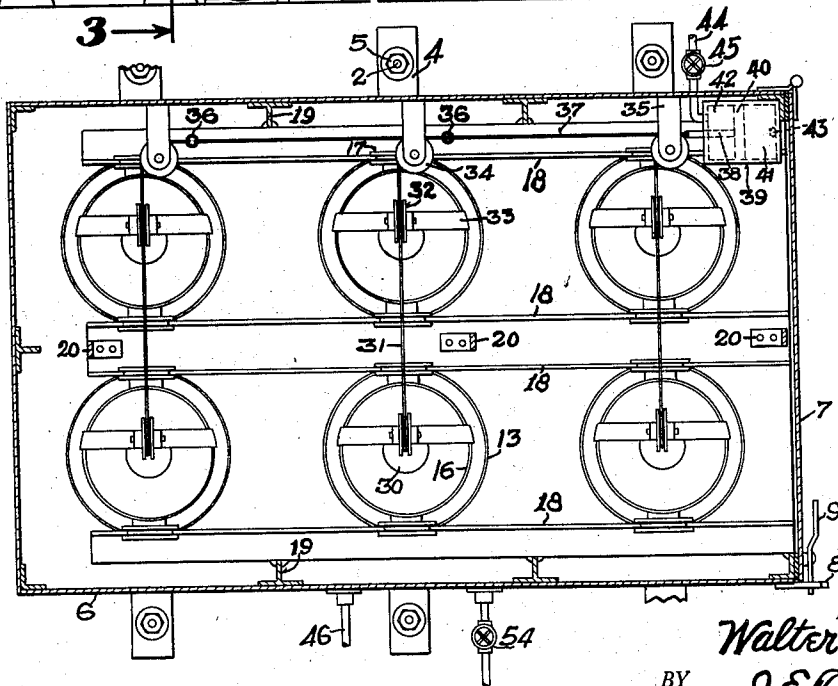
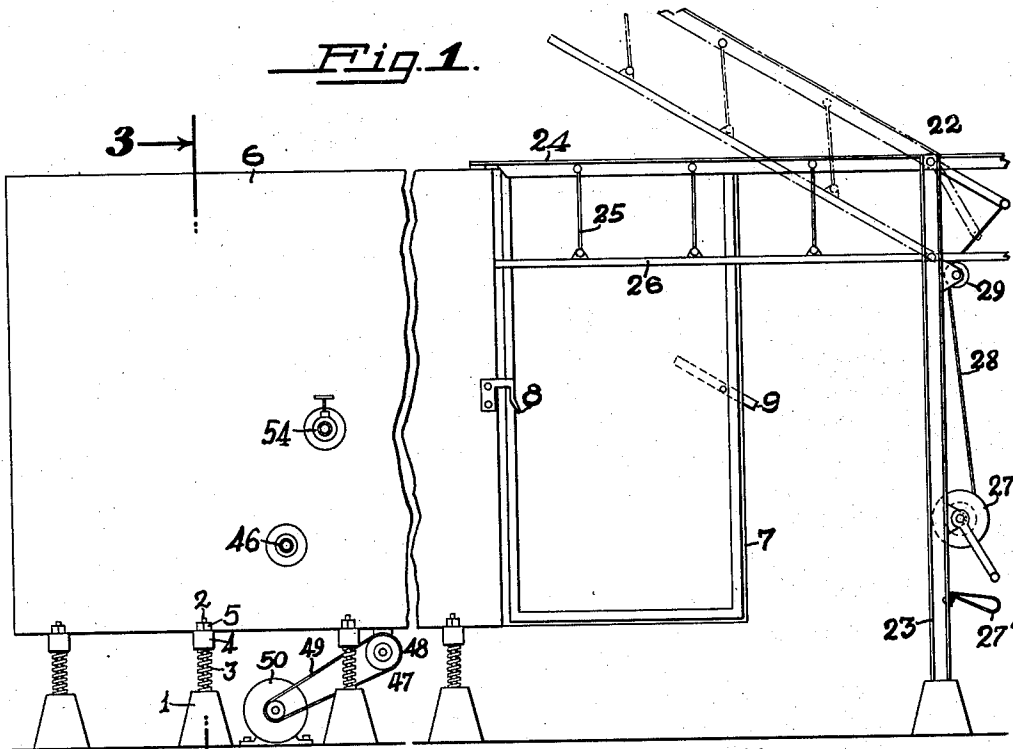


Fig. 2.

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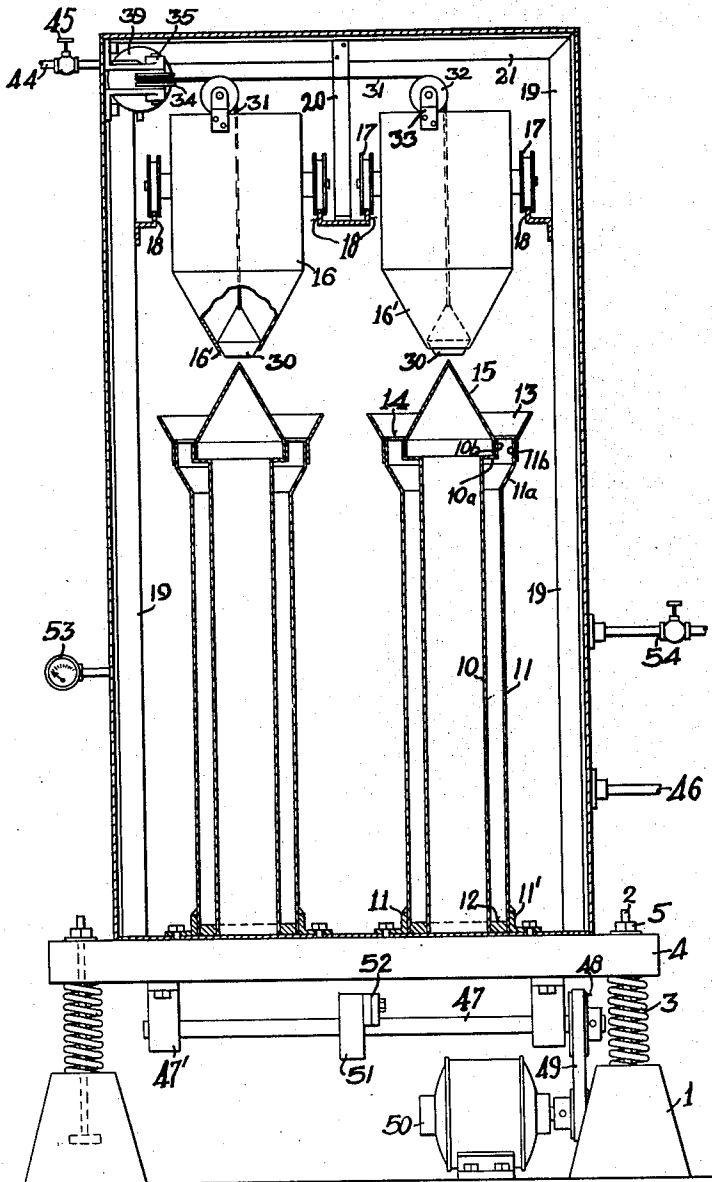


Fig. 3.

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APPARATUS FOR MANUFACTURING PLASTIC ARTICLES

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4 Claims. (Cl. 25—30)

This invention relates to an improved apparatus for manufacturing tubular or other suitably shaped articles from concrete or other analogous material.

Another object of my invention is to provide improved apparatus of the kind characterized by which concrete articles having increased density and comparatively free of air holes may be made.

Other and further objects of my invention will be pointed out hereinafter, indicated in the appended claims, or obvious to one skilled in the art upon an understanding of the present disclosure. For the purposes of this application I have elected to show herein certain forms and details of apparatus for manufacturing concrete pipe representative of my invention; it is understood, however, that the embodiment of my invention herein shown and described is for the purpose of illustration only, and that therefore it is not to be regarded as exhaustive of the variations of the invention, nor is it to be given interpretation such as might have the effect of limiting the claims, short of the true and most comprehensive scope of the invention in the art.

In the accompanying drawings:

Fig. 1 is a side elevation of concrete pipe manufacturing apparatus embodying the preferred form of my invention, showing the tank door in an open position.

Fig. 2 is a top plan view of the apparatus with the top of vacuum tank removed; and

Fig. 3 is a sectional view taken on the line 3—3 of Fig. 1.

Referring to the drawings, the numeral 1 designates a number of stationary concrete supports within which are imbedded upright metal posts 2. Encircling the metal posts are coil springs 3 which yieldably support a number of transversely extending joists 4. The upright posts 2 extend through oversize holes in the joists 4 and are provided with threaded ends for the attachment of nuts 5. Suitably secured to and supported on the joists 4 is a vacuum tank 6 of any suitable shape and size having a hinged door 7 at one end thereof. Suitable means, such as a keeper 8 and a pivoted latch member 9, is provided for releasably holding the door 7 in a closed position. The vacuum tank 6 is preferably made from reenforced sheet metal, and its interior is closed to the outer atmosphere when the door 7 is tightly shut. Positioned within the vacuum tank are one or more concrete forms within which the flowable concrete material is poured. While I have shown the concrete forms to be of the kind adapted for use in making con-

crete pipe, it is to be understood that suitable forms embodying shapes and constructions for making various other types of articles may be satisfactorily employed in practicing my invention. The forms herein illustrated each comprise inner and outer concentrically arranged vertical tubular members 10 and 11. The outer tubular member 11 of each form is provided at its lower end with a number of outwardly disposed projections 11' which are firmly bolted to the bottom of the tank 6. The lower end of the inner tubular member 10 is maintained in a fixed position with respect to the lower end of the outer tubular member 11 by a spacing ring 12 which rests on the bottom of the tank. The upper end of the inner tubular member 10 is preferably formed with an outwardly disposed horizontal annular part 10a and an upwardly extending part 10b, while the upper end of the outer tubular member 11 is bent outwardly and upwardly as at 11a and 11b, the said tubular members being so formed at their upper ends to provide the pipe which is cast therein with an enlarged end fitting of suitable shape and size. So that a form may be conveniently removed from the hardened concrete material forming the cast or molded pipe, the inner tubular member 10 is provided with a collapsible construction of the kind now commonly used while the outer tubular member 11 is also provided with a removable construction of the usual kind.

Secured in any suitable manner to the upwardly disposed part 11b of the outer tubular member 11 is an outwardly flared annular hopper 13 which is rigidly connected by an annular grating 14 to an inverted cone-shaped guide member 15 which rests upon the upwardly disposed part 10b of the inner tubular member 10. The hopper 13 and the guide member 15 are so shaped and positioned that flowable concrete or plastic material falling from a hopper or conveyor 16 onto the said guide member is directed into the annular space located within the tubular form.

Each of the pipe forms is supplied with concrete or plastic material by a movable conveyor 16 having flanged wheels 17 which ride upon horizontally disposed rails 18 located in suitable positions in the upper areas of the tank 6. The side rails 18 are preferably welded to vertical side braces or reenforcing members 19 secured to the side walls of the tank, while the intermediate rails 18 are suspended from vertical bars 20 welded to similar braces or reenforcing members 21 at the top of said tank.

Pivotaly attached as at 22 to the upper ends

of upright posts 23 (only one shown on the drawings) are a plurality of suitably connected rail supports 24 (only one shown) which are adapted to assume substantially horizontal positions with adjacent ends thereof resting on the tank 6. Suspended from the rail supports 24, as by pivoted straps or rods 25, are a number of rails 26 which are adapted to be positioned in horizontal alignment with the rails 18 located inside the tank 6. The rails 26 constitute extensions for the rails 18 and permit the conveyors 16 to be moved to a loading station (not shown) where they may be filled with concrete or other plastic material. After the conveyors 16 are loaded with flowable concrete or plastic material they are moved into the tank 6 and positioned with their tapered discharge ends 16' directly over the center of the inverted conical-shaped guide members 15. So as to elevate the rails 26 and the rail supports 24 in order that the tank door 7 may be closed, suitable means is provided consisting of a reel 27 mounted on one of the posts 23, a cable 28 connected at its ends to the reel and to one of the rail supports, and a pulley 29 over which the said cable extends. By turning the handle of the reel 27 the cable 28 is wound thereon, thereby moving the rail supports 24 and the rails 26 to upwardly inclined positions as shown by the dotted lines of Fig. 1. A looped strap 27' is adapted to receive the handle of the reel to prevent the latter's unwinding.

The discharge opening in the tapered end 16' of each conveyor 16 is controlled by a weighted plug or gate 30 which is suspended from an individual cable 31. The cables 31 extend over suitably grooved rollers 32 mounted on cross members 33 secured to the top ends of the conveyors 16 and also over similar rollers 34 supported on brackets 35 secured to the tank 6. The cables 31 are detachably fastened as at rings 36 to a master cable 37 which is fastened at one end to a connecting rod 38. The connecting rod 38 extends into a suitably shaped casing 39 and is connected to a fitted piston 40 which divides the interior of the said casing into chambers 41 and 42. An opening at one end of the casing permits air to be withdrawn or expelled into the tank 6 from the chamber 41, while an opening in the opposite end of the casing to which a pipe 44 is connected permits air to enter chamber 42 under pressure from a suitable source. A valve 45 on the pipe 44 serves to control the admittance of air into chamber 42 of the casing 39, or automatic means of any well known kind may also be used. After a partial vacuum has been created inside the tank 6, as well as inside the forms 10 and 11, by withdrawing air therefrom by suitable means such as a vacuum pump connected to a pipe 46 communicating with the interior of said tank, air under pressure is admitted into chamber 42 of the casing 39, thereby moving the piston 40 toward the door end of the tank. As the piston is thus actuated, the connecting rod 38, as well as the cables 37 and 31, move with it, thereby causing the gates 30 to be raised from the discharge openings in the tapered ends 16' of the conveyors 16. It is preferable to open the discharge openings in the conveyors gradually so as to permit a fairly thin and ring-shaped film of flowable concrete or plastic material to flow downwardly over the peripheries of the gates 30 and onto the inclined sides of the latter's associated inverted cone-shaped guide members 15. It is well known in the art that the removal of excess air and water from the mass of plastic concrete material

will considerably increase the mechanical strength of a product manufactured therefrom. So as to effectively cause the concrete material delivered by the conveyors 16 to be thoroughly exposed to the vacuum before entering the forms and thereby freed of excess moisture and air, I have made the guide members 15 in the shape of inverted cones so that the said concrete material may be increasingly spread and separated as it proceeds from the conveyors to the forms. The thorough exposure of concrete or plastic material in this manner to the vacuum enables the entrained air and excess moisture therein to be withdrawn prior to its entering the forms. The concrete or plastic material upon passing through the gratings 14 is further broken up and freed of any lumps which might be therein, thereby enabling the partial vacuum in the tank and forms to act upon any of the mass which had not previously been exposed.

Mounted in suitable bearings 47' secured to one of the joists 4 is a shaft 47 having a pulley 48 secured thereto which is operatively connected by a belt 49 to the drive shaft of a motor 50. Secured to the shaft 47 is a disc 51 having weights 52 secured thereto at only one side of its axis. The eccentric position of the weights 52 on the disc 51 causes the shaft 47 to be vibrated when it is rotated at a suitable speed. The belt 49 is preferably provided with expansible and contractible means of the usual kind to compensate for the vibration of the shaft. The vibration of the shaft is transferred to the tank 6 and to all of the various parts of the apparatus the latter supports, thus not only the tubular forms are agitated but also the conveyors 16 of the concrete or plastic material and the guide means 15. The agitation of the material while in the conveyors 16 and as it spreads and flows over the guide members 15 causes the release of air pockets, the reducing of the same to a plastic state, and the otherwise thorough mixing of its ingredients.

A vacuum gauge 53 indicates the degree of vacuum in the tank, while a valve controlled air inlet means 54 allows air to enter the tank to break the partial vacuum after the forms have been properly filled with concrete or plastic material.

In actual practice a suitable degree of vacuum is created in the tank 6 and inside the forms 10 and 11 before the discharge openings of the conveyors 16 are opened to allow the flow of the material therefrom. As the gates 30 are opened to commence the discharge of the concrete or plastic material onto the guide members 15, (or prior thereto if so desired), the motor 50 is started and continuously operated to cause the vibration of the tank, the guide members, the gratings 14, the forms and other parts of the apparatus during the period the forms are being filled. The previous evacuation of air from the interior of the forms prior to the deposit therein of the concrete or plastic material and the confining of the said material in a vacuum during the entire time it flows from the conveyors to the forms, obviates any chance of air being entrained to produce holes in the finally completed product. The constant high speed vibration of the forms during the deposit of the concrete or plastic material therein, causes the density of the pipe to be materially increased. After the forms are properly filled with the concrete or plastic material, the motor's operation is discontinued and the tank is opened to the outer atmosphere by opening the valve associated with the air inlet means 54.

The completed lengths of pipe or other articles made in accordance with my invention are almost entirely free of the usual and undesirable indentations caused by presence of air pockets. The increased density of the pipes thus made renders them impervious to air or moisture, and otherwise strengthens them materially.

Having described my invention, what I claim is:

1. An apparatus of the kind described comprising a vacuum tank, means connected to said tank to remove the air therefrom, a conveyor movably supported within said tank for holding plastic material, the said conveyor having a discharge opening, gate means for controlling said discharge opening, an operating device for said gate means including a motor carried within said tank, means for controlling said motor operable outside said tank, a form or mold positioned in said tank in spaced relation to said conveyor, and guide means for directing the plastic material from the conveyor to said form or mold.

2. In an apparatus as set forth in claim 1, means for agitating the tank and its contents.

3. An apparatus of the kind described comprising a vacuum tank, means connected to said tank to remove the air therefrom, a plurality of conveyors movably supported within said tank for holding plastic material, each of said conveyors having a discharge opening therein, gate means in each conveyor for controlling the discharge openings, a motor within said tank, connecting means between each of said gate means and said motor, means for controlling said motor, a plurality of forms or molds positioned in said tank in spaced relation to each of said conveyors, and guide means for each of said conveyors for directing the plastic material from the conveyors to said forms or molds.

4. In an apparatus as set forth in claim 3, means for agitating the tank and its contents.

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