Nov. 15, 1966 G. BOOTH 3,284,867

MACHINES FOR FORMING HOLLOW CORED CONCRETE PRODUCTS

Filed Jan. 23, 1964 2 Sheets-Sheet 1

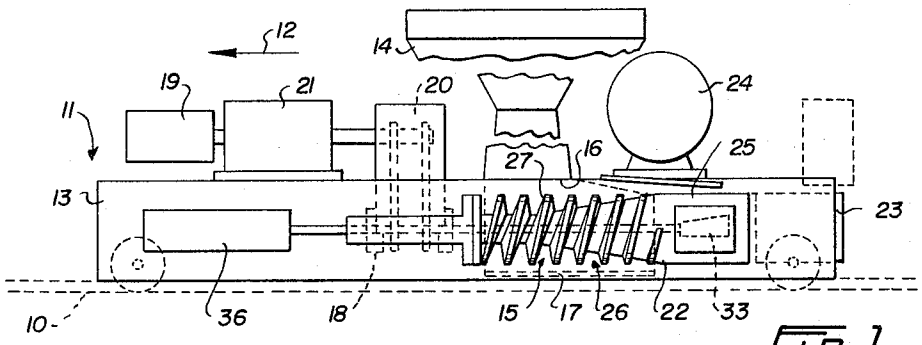


Fig. 1.

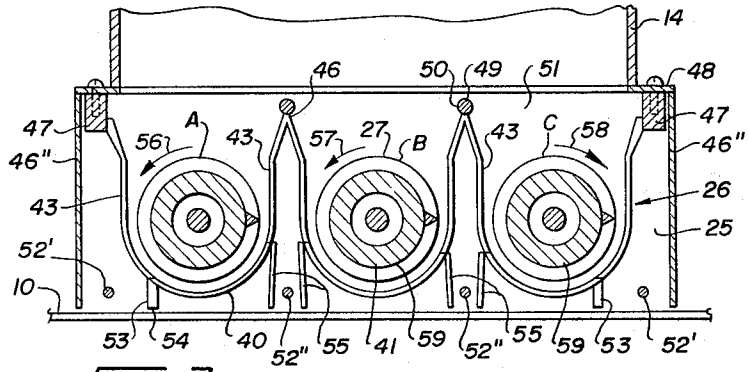


Fig. 2.

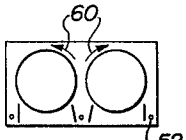


Fig. 5.

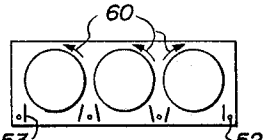


Fig. 6.

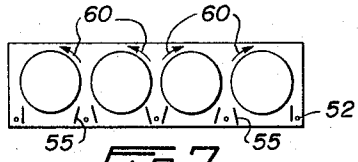


Fig. 7.

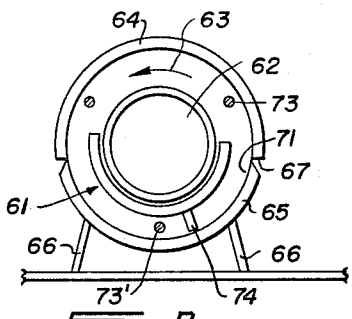


Fig. 8.

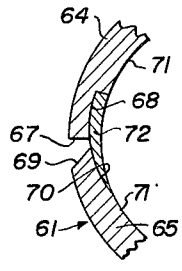


Fig. 9.

INVENTOR
GLEN BOOTH
By Watson, Cole, Grindle & Watson
HIS ATTYS

Nov. 15, 1966 G. BOOTH 3,284,867

MACHINES FOR FORMING HOLLOW CORED CONCRETE PRODUCTS

Filed Jan. 23, 1964 2 Sheets-Sheet 2

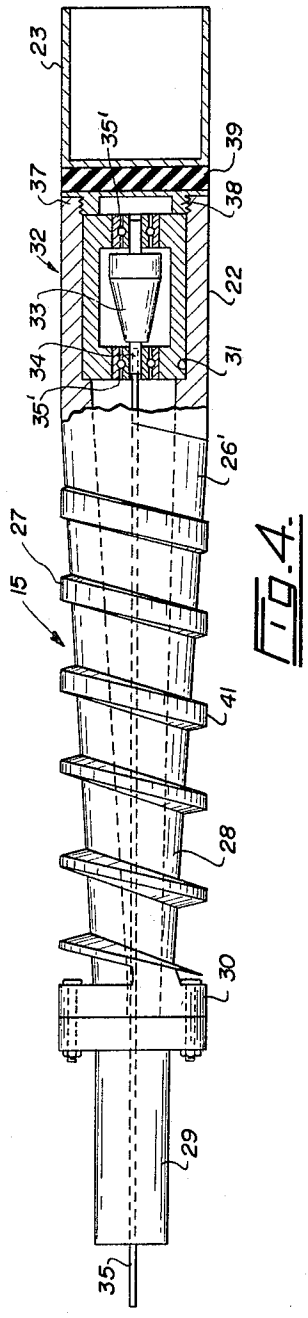


FIG. 4.

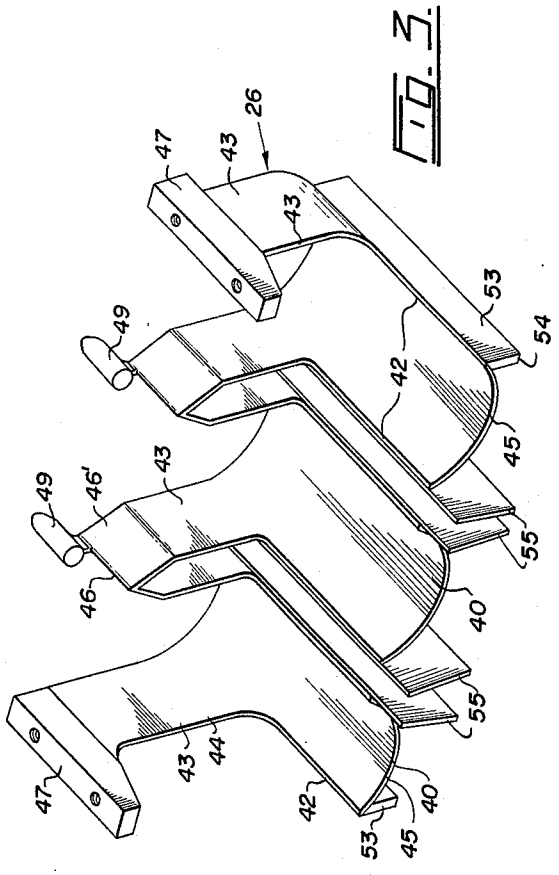


FIG. 3.

INVENTOR
GLEN BOOTH
By Christensen & Allen
ATTYS

United States Patent Office 3,284,867
Patented Nov. 15, 1966

3,284,867

MACHINES FOR FORMING HOLLOW CORED CONCRETE PRODUCTS

Glen Booth, Winnipeg, Manitoba, Canada, assignor to Spiroll Corporation Ltd., Winnipeg, Manitoba, Canada

Filed Jan. 23, 1964, Ser. No. 339,780
4 Claims. (Cl. 25—32)

My invention relates to new and useful improvements in devices for forming hollow cored reinforced concrete products and specifically to improvements to the device for forming such products described in Canadian Patent No. 623,476, dated July 11, 1961.

This patent teaches a method of forming longitudinally cored concrete slabs or the like upon a longitudinally extending pallet by augering the material, vibrating same and compressing the material into the required form, the compression of the material moving the machine rearwardly as the formed product is retruded therefrom.

I have found that this machine is capable of several novel improvements thus permitting same to be utilized with a greater range of concrete particularly having regard to the plasticity of the concrete and the size and type of aggregate used in the manufacture of the concrete.

Specifically I have found that the inclusion of a separate vibrating assembly in each auger assembly improves the flow characteristics of the concrete during the forming of the product, reduces cavitation, and ensures a smooth uninterrupted outer surface to the formed product.

Furthermore in conjunction with the vibrating assemblies within the auger assemblies, I have found it desirable to incorporate a novel shield assembly which partially surrounds the lower segment of each of the auger assemblies for a portion of the length thereof, thus assisting in the forming the walls of the product, particularly the upper and side walls.

Also of importance in this novel shield assembly are shields for the reinforcing-cables thus ensuring that the movement of the product forming material, during the forming of the product, does not displace the reinforcing-cables. Without these reinforcing-cable shields, I have found a tendency for the rotation of the augers to move material by inertia and friction, past or near the cables thus displacing same in the finished product.

The angulation or position of these cable shields also prevents undue pressure from the product forming material, from moving the cables vertically, once again depending upon the direction of rotation of the auger assemblies adjacent the cables.

The principal object and essence of this invention is therefore to provide shield assemblies for the product forming augers and the reinforcing cables which, together with the vibrating assemblies within the auger assemblies, enable me to produce an efficient, accurate product with stable dimensions and excellent exterior and interior finish.

Another object of the invention is to provide a device of the character herewithin described which reduces the frictional coefficient between the product forming material and the device thus preventing any dragging from occurring as well as preventing any undesirable cavitation or broken corners.

Yet another object of the invention is to provide a device of the character herewithin described which maintains the reinforcing-cables in the desired position irrespective of the direction of rotation of the product forming augers.

A still further object of the invention is to provide a device of the character herewithin described which can readily be incorporated in the machines constructed in accordance with the above identified Canadian patent.

With the foregoing objects in view, and such other objects and advantages as will become apparent to those skilled in the art to which this invention relates as this specificatioin proceeds, my invention consists essentially in the arrangement and construtcion of parts all as hereinafter more particularly described, reference being had to the accompanying drawings in which:

FIGURE 1 is a partially schematic view of the device for forming hollow cored concrete sections showing the present invention in position therein.

FIGURE 2 is an enlarged end elevation of the shield assembly showing the location with respect to the auger assemblies, the pallet, and the sides of the product forming chamber.

FIGURE 3 is an enlarged isometric view of the shield assembly used with a three auger machine.

FIGURE 4 is an enlarged partially sectioned view of one of the auger assemblies showing the vibrating assembly incorporated therein.

FIGURE 5 is a schematic end view of one type of product showing the direction of rotation of the forming augers, and the positioning of the cable shields.

FIGURE 6 is similar to FIGURE 5 but showing a three auger assembly device.

FIGURE 7 is similar to FIGURES 5 and 6 but showing a four auger assembly device.

FIGURE 8 is an end elevation of a device adapted to form reinforced concrete pipe.

FIGURE 9 is an enlarged fragmentary view showing the junction between the product forming chamber and the pallet of the device in FIGURE 8.

In the drawings like characters of reference indicate corresponding parts in the different figures.

Proceeding therefore to describe the invention in detail, reference should first be made to FIGURE 1 of the drawings which shows schematically the basic principals behind the machine described in the above identified patent.

Reference character **10** shows in phantom the longitudinally extending pallet upon which the machine collectively designated **11** is adapted to move in the direction of arrow **12**, retruding hollow cored reinforced concrete product therefrom.

Reference character **13** illustrates the side members of the general framework carrying a hopper **14** within which product forming material such as concrete mix is placed.

A tapered auger assembly **15** extends longitudinally from below the hopper outlet **16**, within an auger chamber **17**, said auger assembly being journalled within bearing assemblies **18** and driven by a source of power **19** through chain or belt drive **20**, gear box **21** being situated between the source of power and the chain drive **20** for controlling the speed of rotation of the auger assemblies **15**.

Situated upon the end of the auger portion **15** is a trowelling mandrel **22** rotating with the auger and a mandrel follower **23** is situated upon the end of the trowelling mandrel **22**, details of which will be described subsequently.

A vibrating assembly **24** is situated upon the framework **13** above the trowelling section **25** and assists in plasticizing the concrete mix as it is being augered by the auger assembly thus permitting the product to be moulded by the trowelling assembly and the product forming chamber.

The shield assembly collectively designated **26** is shown in phantom in FIGURE 1 associated with the major portion of the auger flight **27** of the auger assembly **15**.

Dealing next with FIGURE 4, this view shows an enlarged partially sectioned representation of one of the auger assemblies **15** including the main auger shaft **28**

and having the drive shaft 29 secured upon the front end 30 thereof.

The trowelling mandrel 25 is formed upon the rear end 26 of the auger flight shaft 15 and this mandrel, which is cylindrical in cross section, is provided with a recess 31 adapted to receive a vibrating assembly collectively designated 32.

This vibrating assembly consists of an offset weight portion 33 secured to a drive shaft 34 and adapted to rotate within bearings 35' which support the drive shaft.

This drive shaft extends forwardly through the auger shaft 28, which is hollow, and through the main drive shaft 29 extending forwardly as at 35 to be connected to a source of power 36 carried within the main framework 13 (see FIGURE 1).

A cylindrical trowel follower 23 forms the final bores within the product and is secured upon the rear end 37 of the trowelling section 25 by the screw threaded attachment 38 shown in FIGURE 4. A pad 39 of resilient material such as rubber, is interposed between the follower 23 and the trowelling section 25 to prevent vibration from being transferred from the trowelling section to the follower, thus permitting the follower to produce a smooth cylindrical finish to the bores of the product.

FIGURES 2 and 3 show the details of construction of the shield assembly 26 and these examples are designed for use with devices having three spaced and parallel auger assemblies thus providing a three-cored product similar to that illustrated schematically in FIGURE 6.

However, it will be appreciated that a similar design is utilized depending entirely upon the number of cores or apertures required.

The shield assembly comprises semi-cylindrical auger shield portions 40, one for each auger assembly, adapted to enclose the lower runs 41 of each of the auger assemblies, the auger flight 27 being situated just clear of the inner surface of the shield portions 40.

Extending upwardly from the edges 42 of each of the shield portions 40 is a shield side 43 preferably formed integrally with the shield portion 40. These shield sides are substantially in spaced and parallel relationship with one another and it will be noted that the rear edge 44 of the shield side terminates spaced from the rear edge 45 of the auger shield portion 40 thus permitting the product forming material to flow into contact with the side plates 46'' of the product forming chamber 25.

Where two adjacent vertical sides 44 are located, it is desirable to connect them together by means of the upper edges 46 thereof which can either be welded, or alternatively, the entire device can be stamped or otherwise formed from one piece of metal.

The outermost shield sides 43 are provided with attachment blocks 47 upon the upper edges thereof and these attachment blocks are bolted to the side base walls 48 of the hopper 14.

Extending forwardly from adjacent the forward ends 46' of the intermediate shield sides, are locating and supporting pins 49 adapted to engage drillings 50 within the front hopper bulkhead 51 thus supporting the shield assembly in the position shown in FIGURE 2 with relation to the auger assemblies.

The semi-cylindrical shield portions 40 prevent the product forming material from packing upon the pallet 10 and permit the vibrating assembly within the auger assembly to reduce the coefficient of friction between the product forming material and the augers and sides of the product forming chamber.

The rotation of the auger assemblies 41 causes certain pressures to be induced by the plasticized product forming material thus tending to displace the reinforcing cables 52 around which the product is being formed and to prevent this displacement from occurring, I have provided reinforcing-cable shields in conjunction with the shield assembly 26.

Dealing first with the cable shields shown in FIGURE 2, the outermost reinforcing-cables 52' are maintained in their desired location by downwardly extending cable shield strips 53 situated adjacent the outer edge 42 of the semi-cylindrical auger shield portion 40 and the lower extremity 54 of this cable shield is spaced just above the surface of the pallet 10. This prevents any side thrust from the product forming material, inferencing the position of the cables 52 but still permits the product forming material to flow around the cables after it has passed the rear edge 45 of the shield assemblies.

The inner cables 52'' are provided with reinforcing-cable shields 55 upon each side thereof and secured to and extending downwardly from the side edges 42 of the shield portions 40.

References to FIGURES 2, 5, 6 and 7 will show that these cable shield plates are inclined with respect to one another and the inclination direction depends upon the direction of rotation of the auger assemblies.

In the example shown in FIGURE 2, which is viewed from the rear of the machine, auger A rotates in the direction of arrow 56, auger B rotates in the direction of arrow 57, and auger C rotates in the direction of arrow 58.

It will be noted that the lower runs 59 of augers B and C are rotating towards one another inasmuch as these two augers are rotating in opposite directions. The lower runs refer to the portion of the auger enclosed by the auger shield portions 40.

This means that product forming material also tends to be moved or urged in the direction of arrows 57 and 58 and without the cable shields 55, there is a tendency for the reinforcing-cable between these two augers, to be lifted out of position.

The cable shields 55 between these two auger assemblies B and C therefore incline inwardly and downwardly towards one another thus restricting the amount of product forming material that can enter between the pallet 10 and the reinforcing-cable 52' until such material is clear of the auger flights.

By contrast, the under runs of the auger assemblies A and B are travelling in the same direction and there is tendency for the product forming material to force this cable downwardly out of position. Under these circumstances the cable shields 55 diverge downwardly and outwardly thus restricting the amount of product forming material that can enter above the cable 52'' until same are clear of the auger flights.

Reference to FIGURES 5, 6 and 7 show schematically, the angle of inclination of the reinforcing cable guards in relat ion to the direction of rotation of the auger assemblies shown by the corresponding arrow 60.

As a general rule, where the auger assemblies are rotating in the opposite direction so that the under runs of the adjacent auger assemblies are moving towards one another, the cable guard plates incline downwardly and inwardly and when the auger assemblies are travelling in the same direction, the cable guard plates incline downwardly and outwardly from one another.

FIGURES 8 and 9 show a similar type of auger shield assemblies specifically designated 61, particularly designed for use with a device for producing cylindrical concrete pipe.

Reference character 62 illustrates the auger assembly rotating in the direction of arrow 63 within a product forming casing which is semi-cylindrical in configuration and indicated by the reference character 64.

This slides along a semi-cylindrical pallet 65 supported upon legs 66. FIGURE 9 shows an enlarged view of the junction between the portion 64 and the portion 65. Adjacent the lower edge 67 of the portion 64, I have provided a recess 68 and adjacent the upper edge 69 of the portion 65 I have also provided a recess 70 both recesses being formed upon the inner surfaces 71 of the two portions 64 and 65. A curved strip 72 is welded within the recess 68 in the portion 64 and this strip is ground so that it fits within the recess 70 within the portion 65 thus giving an

overlapping relationship between the two portions, yet at the same time maintaining the curved configuration of the inner surfaces **71**. This also prevents material from being squeezed out from between the two portions during the forming of the product.

It is sometimes desirable to provide reinforcing-cables **73** for cylindrical pipe formed by this device, under which circumstances it is desirable to provide a cable shield **74**, for the lowermost reinforcing-cables specifically designated **73'**.

Since various modifications can be made in my invention as hereinabove described, and many apparently widely different embodiments of same made within the spirit and scope of the claims without departing from such spirit and scope, it is intended that all matter contained in the accompanying specification shall be interpreted as illustrative only and not in a limiting sense.

What I claim as my invention is:

1. In a machine for forming hollow cored reinforced concrete products which includes an elongated pallet, supporting framework, said framework adapted to support product reinforcing cables on said pallet around which said product is formed, a product forming material hopper, a feed chamber communicating with said hopper, a plurality of longitudinally spaced and parallel auger assemblies extending through said feed chamber, said auger assemblies having a trowelling portion on the distal ends thereof, and a source of power on said framework for driving said auger assemblies whereby the formed product is retruded from said machine; a shield assembly for said auger assemblies and said reinforcing cables, said shield assembly being secured below said hopper and extending into said feed chamber, said shield assembly comprising in combination a semi-cylindrical shield portion for each of said auger assemblies, and enclosing substantially the lower segment of each auger, said semi-cylindrical shield portion being in spaced and parallel relationship from said auger assembly and in spaced and parallel relationship from the base of said feed chamber, substantially vertically situated shield sides extending upwardly from each side edge of said shield portion, the upper edges of said shield sides adapted to mount said shield assembly in position, the rear vertical edge of each of said shield sides terminating spaced from the rear end of said shield portion, and elongated reinforcing-cable shield strips secured to and extending downwardly from adjacent the sides of said shield portion, said reinforcing-cable shield ships being spaced from said reinforcing-cable.

2. The device according to claim **1** which includes a product vibrating assembly in each of said auger assemblies, a source of power for said vibrating assembly, said vibrating assembly cooperating with said product forming material to reduce the coefficient of friction between said product forming material, and said product forming chamber, said shield assembly, and said auger assembly and to reduce cavitation of said product forming material said reinforcing-cable shield strips being spaced from said reinforcing-cables.

3. The device according to claim **1** in which said reinforcing-cable shields between adjacent pairs of shield portions are positioned to partially shield the reinforcing-cables against product forming material pressure, said cable shields between adjacent pairs of shield portions inclining downwardly and inwardly towards one another when the augers of the adjacent shield portions rotate oppositely to one another with the under runs of said augers moving towards one another, and inclining outwardly and downwardly away from one another when the augers of the adjacent shield portions are rotating in the same direction with the under runs of said augers moving in the same direction.

4. The device according to claim **2** in which said reinforcing-cable shields between adjacent pairs of shield portions are positioned to partially shield the reinforcing-cables against product forming material pressure, said cable shields between adjacent pairs of shield portions inclining downwardly and inwardly towards one another when the augers of the adjacent shield portions rotate oppositely to one another with the under runs of said augers moving towards one another, and inclining outwardly and downwardly away from one another when the augers of the adjacent shield portions are rotating in the same direction with the under runs of said augers moving in the same direction.

References Cited by the Examiner

UNITED STATES PATENTS

952,489	3/1910	Wiggins	25—32
1,887,244	11/1932	Murray	25—32
2,818,790	1/1958	Canfield et al.	25—32
2,938,255	5/1960	Oakden	25—32
3,159,897	12/1964	Ellis et al.	25—32

FOREIGN PATENTS

665,850	7/1963	Canada.
793,942	4/1958	Great Britain.

J. SPENCER OVERHOLSER, *Primary Examiner.*

G. A. KAP, R. D. BALDWIN, *Assistant Examiners.*