May 19, 1931. F. McS. THOMAS 1,805,961

MAGNETIC DRIVE FOR CENTRIFUGAL CASTING MACHINES

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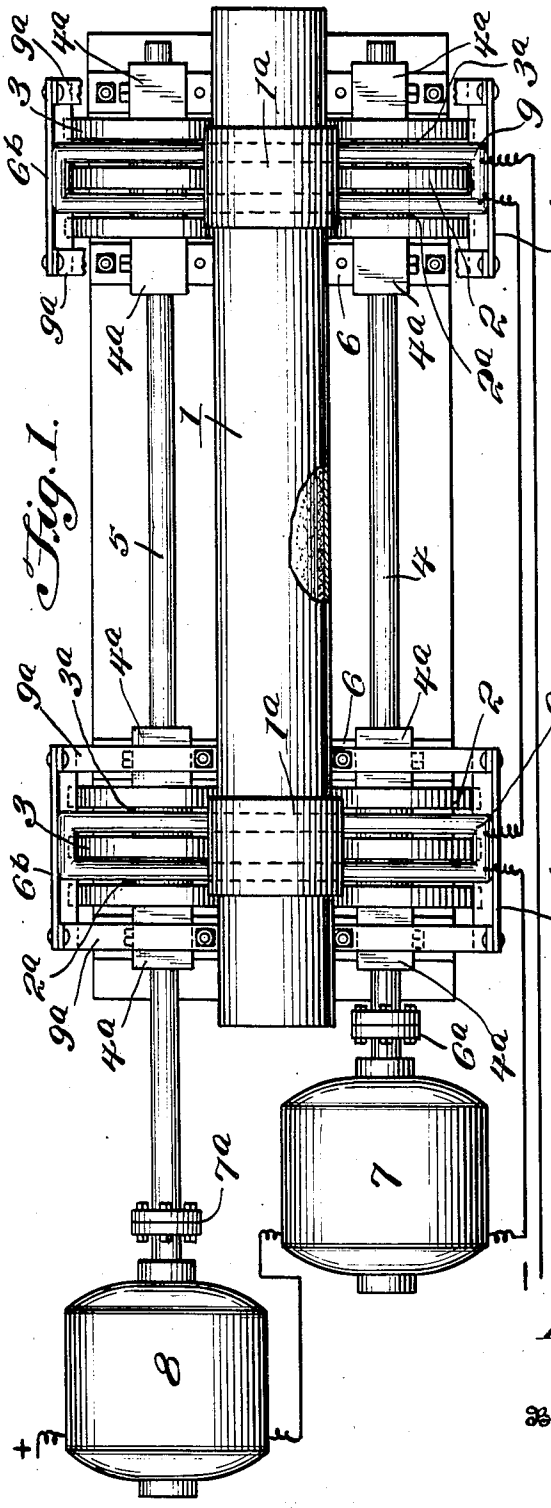

Fig. 1.

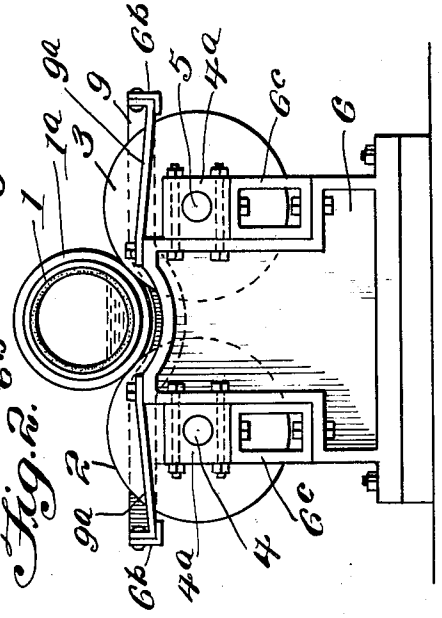

Fig. 2.

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Fig. 4.

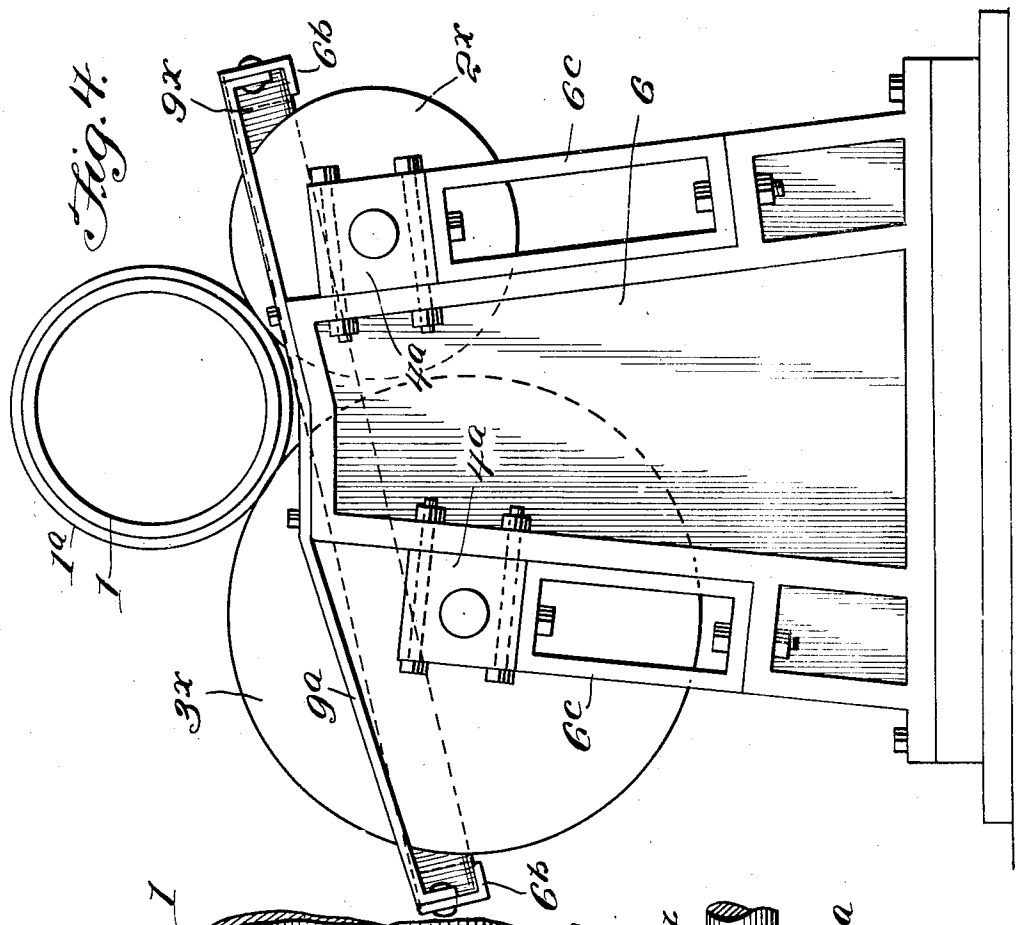

Fig. 3.

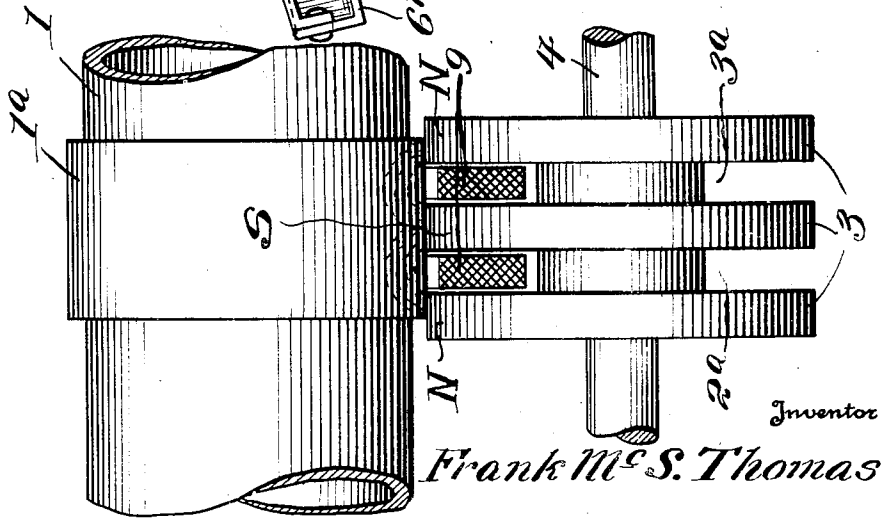

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Fig. 6.

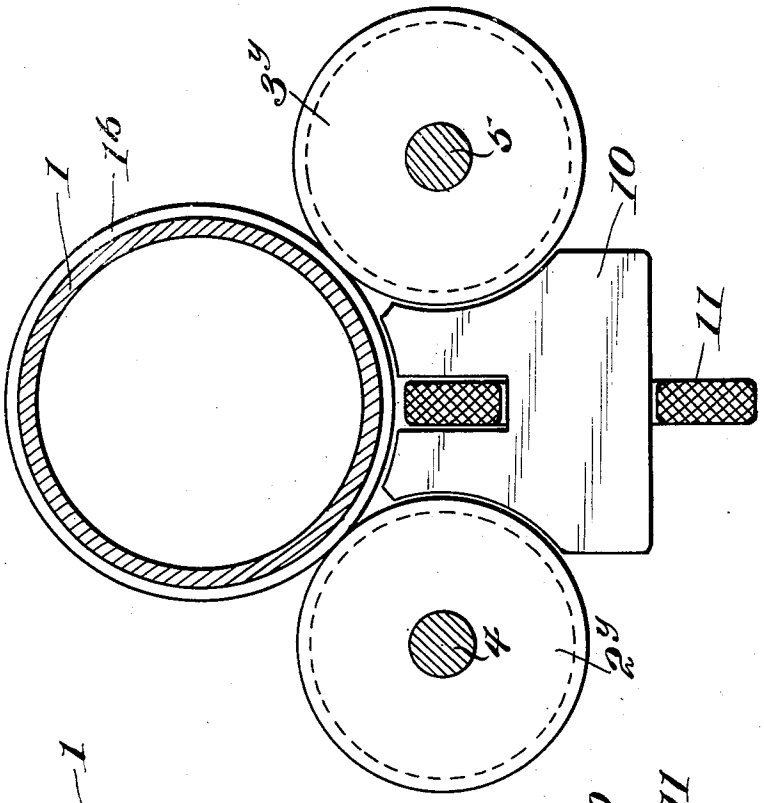
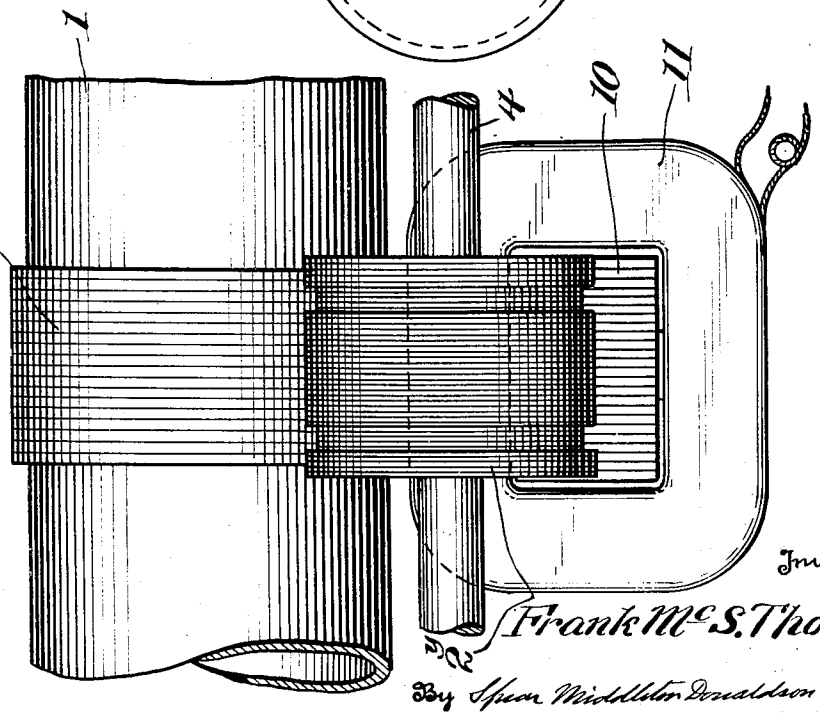


Fig. 5.



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UNITED STATES PATENT OFFICE

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MAGNETIC DRIVE FOR CENTRIFUGAL CASTING MACHINES

Application filed February 7, 1930. Serial No. 426,622.

My said invention relates to centrifugal casting machines of the type employing a cylindrical flask lined with sand which are supported in substantially horizontal position and rotated to properly distribute or position the metal to form the pipe or similar article.

In such machines it is desirable to supply the molten metal to the flask while the latter is being slowly rotated to form a pool in the lower part of the flask of approximately even depth along the length thereof, whereupon the speed is suddenly increased or accelerated to a high degree, from 900 to 1200 R. P. M. which high speed is maintained for several minutes to distribute the metal and condense it by the centrifugal force and causing any impurities in the iron which are of less specific gravity, to travel towards the center of the flask, or in other words, to the inner surface of the pipe formed by the machine.

Great difficulty has heretofore been experienced in securing durable and efficient means for securing such a variable drive.

The present invention aims to provide a simple, economical, durable and efficient means for rotating such flasks which will be free from objections or defects present in prior machines of which I am aware.

The invention further aims to provide a machine which may be operated with a minimum amount of power, and one in which the speed of rotation may be quickly accelerated to any desired degree without danger of slippage or breaking of driving connections.

The invention further aims to provide an arrangement by which the amount of tractive force exerted by the driving roller or rollers on the flask may be increased proportionate to the power required.

With these and other objects in view the invention includes the novel construction hereinafter described, the invention being defined by the claims appended hereto.

An embodiment of the invention is illustrated in the accompanying drawings in which

Figure 1 is a plan view, largely of a diagrammatic nature, illustrating my improved flask supporting and rotating means.

Fig. 2 is an end elevation looking from the right, Fig. 1.

Fig. 3 is an enlarged detail side elevation of a portion of the flask with one of the drive rollers and with the coil shown in section.

Fig. 4 is an end view of a modified form using a simpler form of coil and adapted to be driven by a single motor applied to one roller shaft.

Figs. 5 and 6 are detail views of a further modification.

Referring by reference character to these drawings the numeral 1 designates the flask or mold which is shown in a conventional manner only, for the reason that, except for the collars 1*a* hereinafter more specifically referred to, it may be of the ordinary or any desired construction. Such flasks are customarily formed of ferruginous material such as iron or steel, capable of being magnetized.

For supporting and driving the flask I provide a plurality of pairs of cradle rolls 2 and 3 carried by shafts 4 and 5 journaled in suitable bearings 4*a*, removably bolted to the supporting frame members 6. In this form I have shown both shafts as driven shafts, and for rotating them I prefer to provide electric motors 7 and 8 coupled to shafts by the customary couplings 6*a* and 7*a*.

For securing tractive contact between the drive rolls and flask whereby the latter is prevented from slipping and will be positively rotated with the drive rolls no matter what the amount of power applied, I provide means for causing these parts to be magnetically attracted towards each other during rotation.

This I preferably accomplish by providing the rollers with relatively deep grooves (two each) indicated respectively at 2*a* and 3*a* in which are located solenoids 9 of closed loop form the windings of which are connected with a source of electricity, such solenoids being supported by rectangular frames including side bars 9*a* bolted to the tops of supports 6 and end bars 6*b*.

Preferably I connect the coils of the solenoids in series with the armature coils of the motors 6 and 7 as indicated conventionally in Fig. 1 whereby, when the motor is stationary, the solenoids are inactive and

the flask capable of being readily removed from the cradle rolls or replaced thereon; no top or presser rolls being required in my apparatus.

When the motor is started for slow rotation of the flask the current in the solenoid produces a magnetic attraction between the flask and rolls and holds the flask in position and causes it to be positively driven by the driving rolls. When it is necessary to accelerate the speed of the flask the increased current supplied to the motor also increases the magnetic attraction thereby preventing slippage between the driving rolls and flask and likewise preventing any jumping of the rapidly revolving flask upon or away from the cradle rolls.

By this arrangement I secure relatively slight pressure of the flask on the driving rolls when the motor is developing small power and the speed is slow, with increase in contact pressure at higher power and speed and in proportion thereto, while on stoppage of the machine magnetic attraction ceases as above stated.

To prevent endwise movement of the flask relative to the cradle rolls the flask is provided with peripheral collars or raised portions of iron or steel, indicated at 1*a* which form tracks on which the cradle rolls bear. These "tracks" are of less width than the cradle rolls but bridge the solenoid recesses thereof as shown more clearly in Fig. 3 which illustrates the normal driving position in which the coacting cradle roll projects slightly beyond each edge of the track.

By this arrangement, should the flask tend to move endwise the edge of track 1*a* which is passing out of or reducing the area of contact with the adjacent pole N is powerfully restrained by the magnetism in that particular pole, while the pole N on the opposite side, having had its area of contact with the track increased, exerts less pull on the track which restores the relation shown in Fig. 3 where equilibrium is restored.

To enable the rolls to be removed without dismantling the solenoids and yet give the bearings ample support I provide the frame with open centered blocks 6*c* lying between the bearings and removably bolted in place. By taking out the blocks the bearings may be dropped down sufficiently to enable the rolls to clear the solenoids.

In the form shown in Fig. 4 provision is made for using a simpler form of solenoid, i. e. one lacking the central depression to clear the flask as shown in Fig. 2. To accomplish this the idle roll 3*x* is made very much larger than the driven roll 2*x* whereby a straight solenoid can be used as indicated at 9*x* in dotted lines in said figure.

In the modification shown in Figs. 5 and 6 the rollers 2*y* and 3*y* are magnetized by induction from the magnet 10 which is energized by the coil or solenoid 11. This gives a strong magnetic pull across the air gap between the magnet and rollers and also a strong pull at the points of contact between the flask and rollers. There is further a strong downward pull from the magnet 10 acting directly on the flask.

To avoid the effects of eddy currents in this and other forms the track may be laminated as indicated at 1*b*, or the rollers could be similarly laminated, or annular grooves used instead of laminations.

The following may be mentioned as some of the advantages arising from my invention.

The flask is left free at both ends;

Pressure on the bearings is reduced to the weight of the flask only;

There is no necessity for nice adjustment of rollers or accurate alinement.

No change of rollers or change of spacing is required for various sizes of flasks;

The rollers may be mounted close to each other without danger of displacement of the flask by side motion;

No heavy friction and consequent wear such as occurs in machines using top pressure rollers to secure pressure for tractive purposes;

Economical and rigid construction with low maintenance cost;

Saving in power by elimination of constant current used for magnetic clutches of the electric motor driven type now in use;

No cranking effect in the driving of the flask; and

No necessity of accurately sizing of flask and rollers.

I claim:

1. In a centrifugal casting machine, a flask or mold of magnetizable material, roller means for rotatably supporting said flask, said roller means including a driving roll contacting with the periphery of the flask, and means for producing magnetic attraction between said flask and driving roll.

2. In a centrifugal casting machine, a flask or mold of magnetizable material, a plurality of rolls for rotatably supporting said flask, one or more of said rolls having means for driving the same, said driven roll having a pair of channels in its periphery, and a solenoid located in said channels adjacent the flask.

3. In a centrifugal casting machine, a flask or mold of magnetizable material, a plurality of pairs of rolls supporting said flask, an electric motor for driving one of said rolls, and a solenoid for magnetizing said driven roll having its coils connected in series with the armature coils of said motor.

4. In a centrifugal casting machine, a flask, cradle rolls for supporting said flask, one or more of said rolls having means for rotating it and said flask having a raised annular portion of magnetizable material contacting

with said driven roll, and means for producing magnetic attraction between said driven roll and raised portion of the flask.

5. In a centrifugal casting machine, a flask having a plurality of raised peripheral roller tracks, a plurality of pairs of cradle rolls on which said tracks bear, said cradle rolls being slightly wider than said tracks, means for driving one or more rolls of each pair, and means for producing magnetic attraction between the cradle rolls and said annular tracks.

6. In a centrifugal casting machine a flask having a raised peripheral track, a pair of cradle rolls underlying said track, one of said rolls being of greater width than the track and having peripheral channels, magnetizing coils located in said channels, means for driving said channeled roll, and means for supplying electric current to magnetizing coils.

7. In a centrifugal casting machine, a flask having a raised peripheral track, a pair of cradle rolls underlying said track, one of said rolls being of greater width than the track and having peripheral channels, magnetizing coils located in the channels, an electric motor for driving said channeled roll, and a series connection between the motor armature and said magnetizing coil.

8. In a centrifugal casting machine, the combination with the flask of a pair of coacting rolls thereunder, said rolls having alined peripheral channels, a solenoid in the form of a closed loop lying in said channels and beneath said flask, means for driving one of said cradle rolls, and means of energizing said solenoid.

9. In a centrifugal casting machine the combination with the flask of a pair of cradle rolls thereunder, including a driven roll, said driven roll and flask being of magnetizable material, and an electro-magnet located beneath said flask and between said cradle rolls said electro-magnet creating magnetic attraction between said flask and driven roll and exerting a magnetic pull upon the flask.

10. Apparatus according to claim 1 in which the driving roll is driven by an electric motor and the means for producing the said magnetic attraction is in circuit with the electric motor whereby the magnetic attraction increases with the speed of the motor, substantially as described.

11. In a centrifugal casting machine, a rotatable flask roller means for rotatably supporting said flask, said flask having a magnetizable track with which the roller means contacts and means for producing magnetic attraction between said magnetizable track and the roller means in contact therewith by which the flask is held against axial movement.

In testimony whereof, I affix my signature.

FRANK McS. THOMAS.