Nov. 26, 1935. A. ROCCA 2,022,009

MACHINE FOR COATING METALLIC CORES WITH CEMENT PLASTER BY SPIRAL WINDINGS, PROVIDED WITH DEVICES TO REGULATE THE FORMING AND CONVEYING ROLLERS AND BELTS

Filed Jan. 3, 1933 3 Sheets-Sheet 1

Fig. 1.

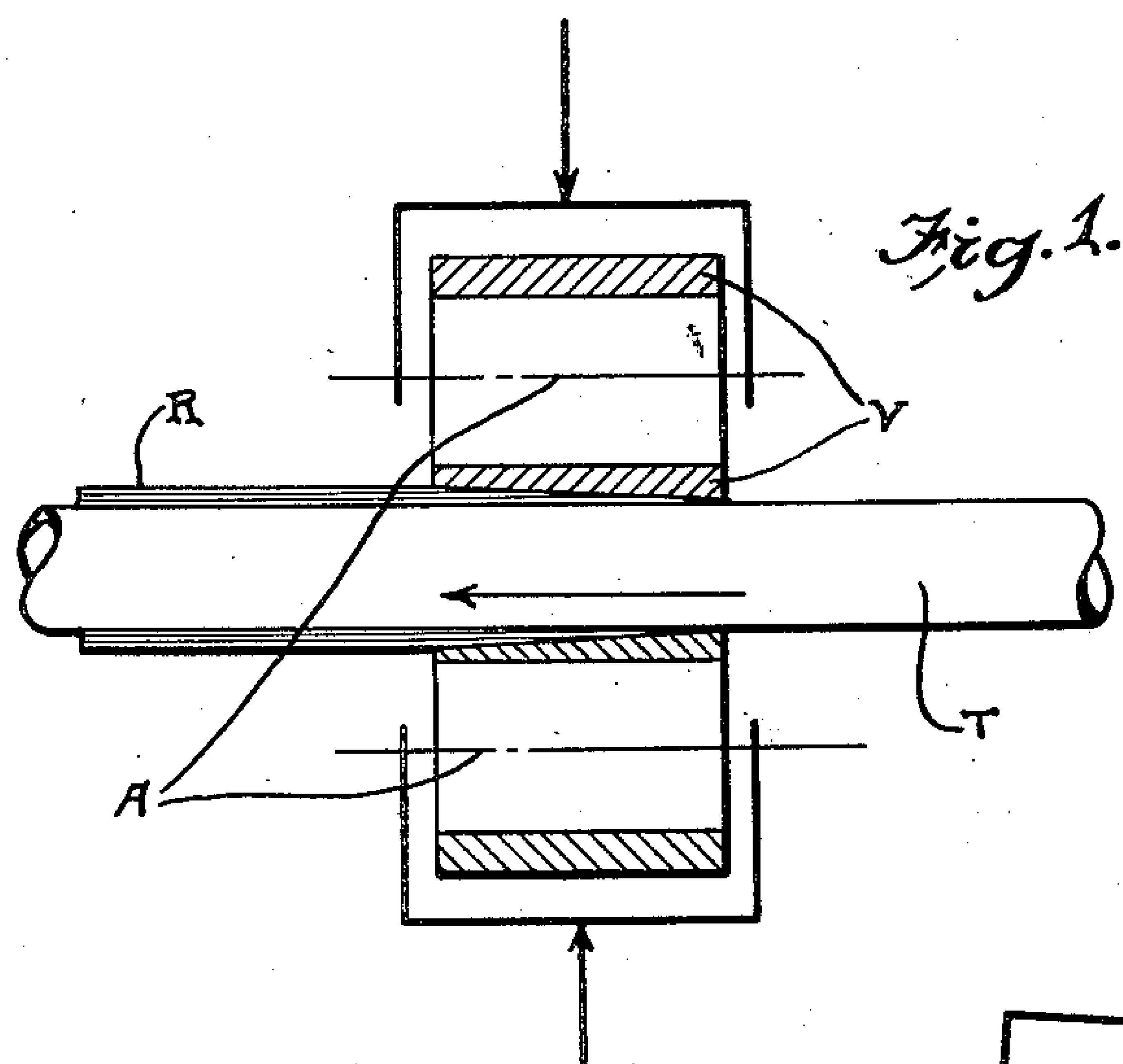


Fig. 2.

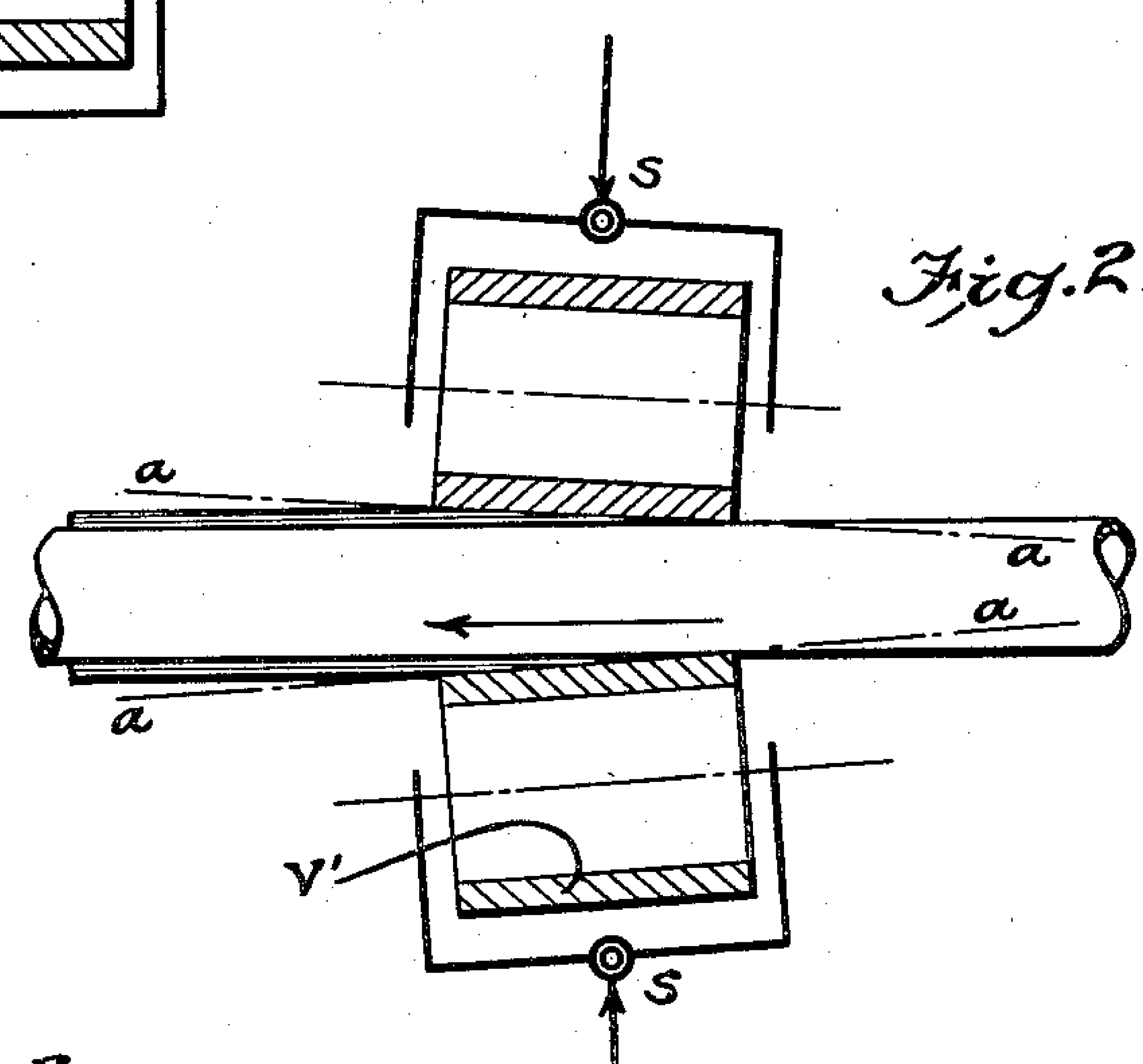
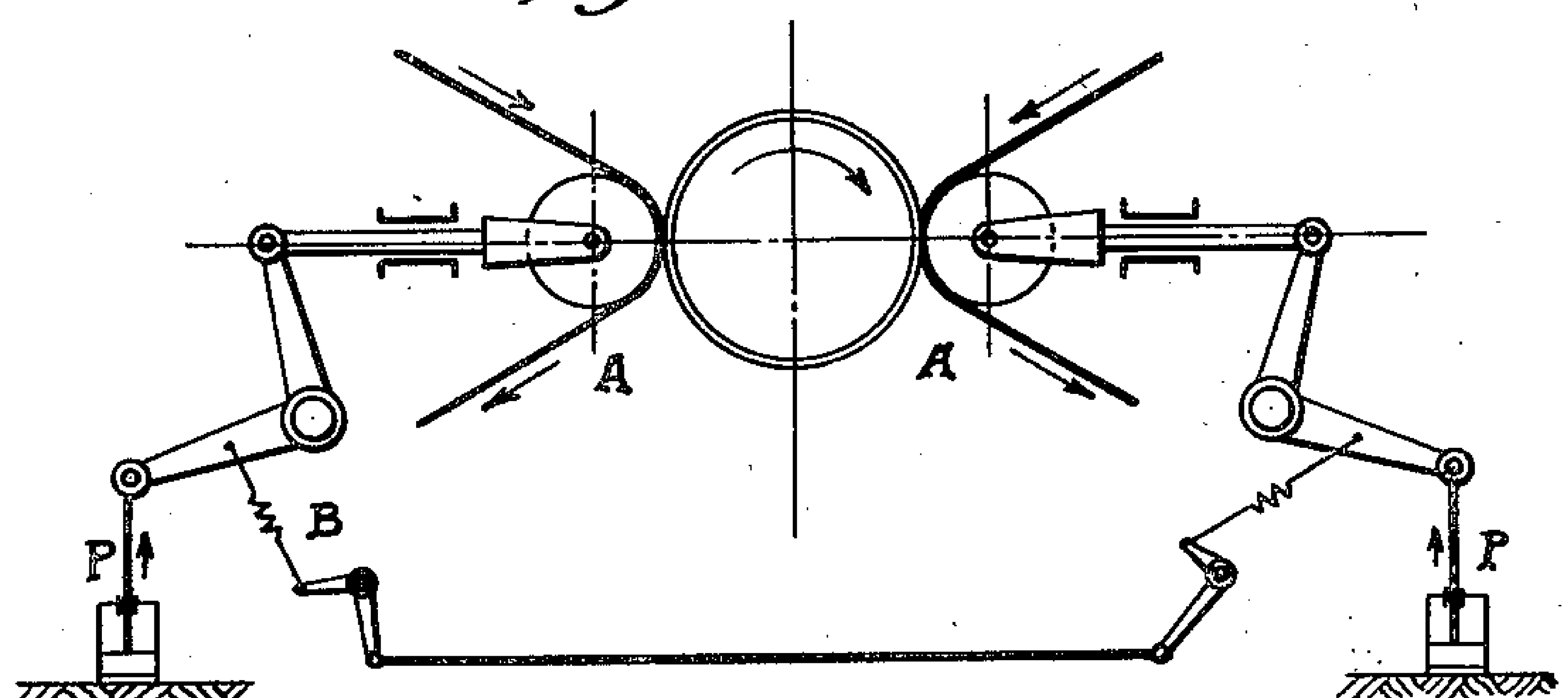


Fig. 3.



Inventor

A. Rocca,

By Emil Bönnelycke

Attorney

Nov. 26, 1935. A. ROCCA 2,022,009

MACHINE FOR COATING METALLIC CORES WITH CEMENT PLASTER BY SPIRAL WINDINGS, PROVIDED WITH DEVICES TO REGULATE THE FORMING AND CONVEYING ROLLERS AND BELTS

Filed Jan. 3, 1933 3 Sheets-Sheet 2

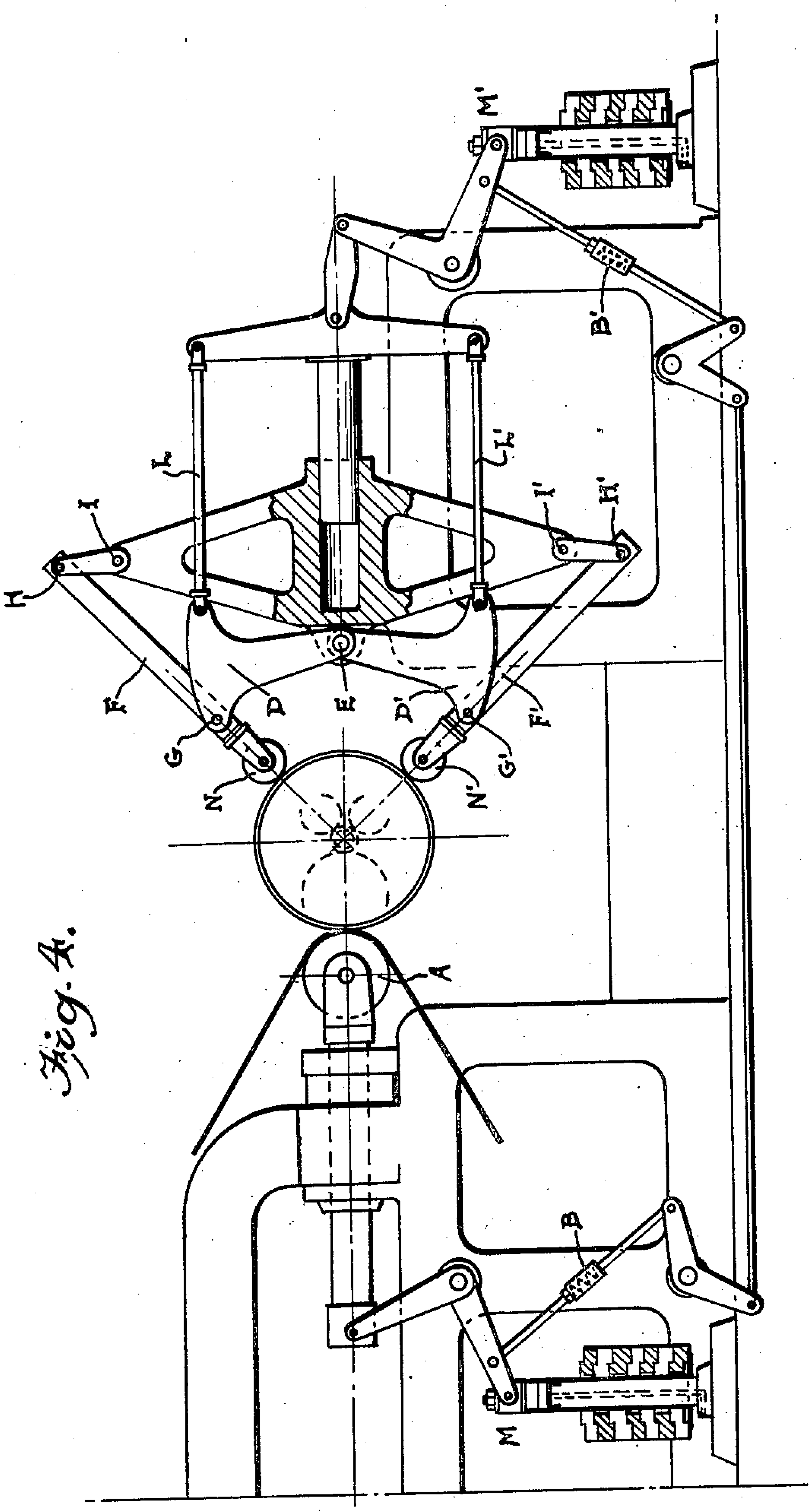


Fig. 4.

Inventor

A. Rocca,

By Emil Bönnelycke

Attorney

Nov. 26, 1935. A. ROCCA 2,022,009

MACHINE FOR COATING METALLIC CORES WITH CEMENT PLASTER BY SPIRAL WINDINGS, PROVIDED WITH DEVICES TO REGULATE THE FORMING AND CONVEYING ROLLERS AND BELTS

Filed Jan. 3, 1933 3 Sheets-Sheet 3

Fig. 5.

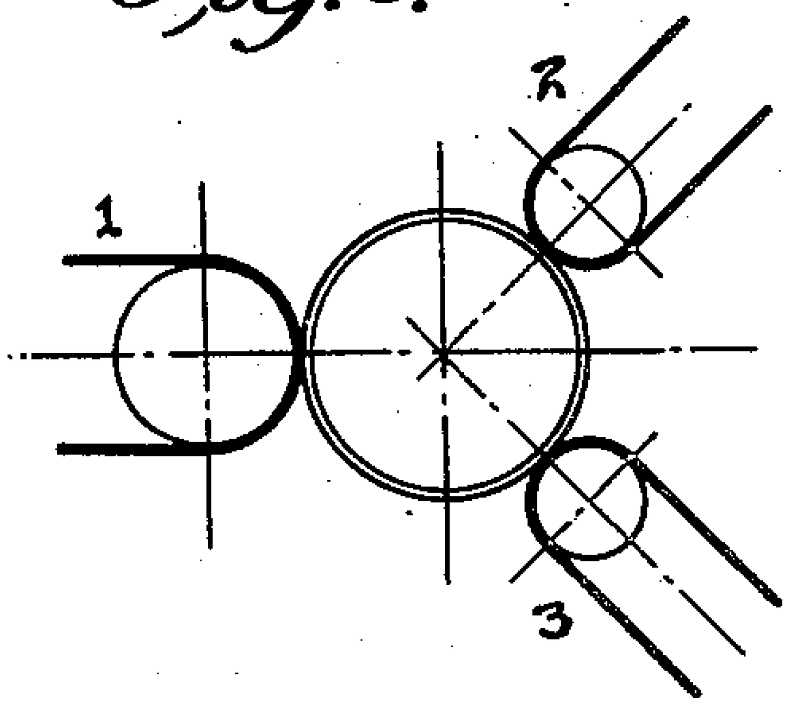


Fig. 6.

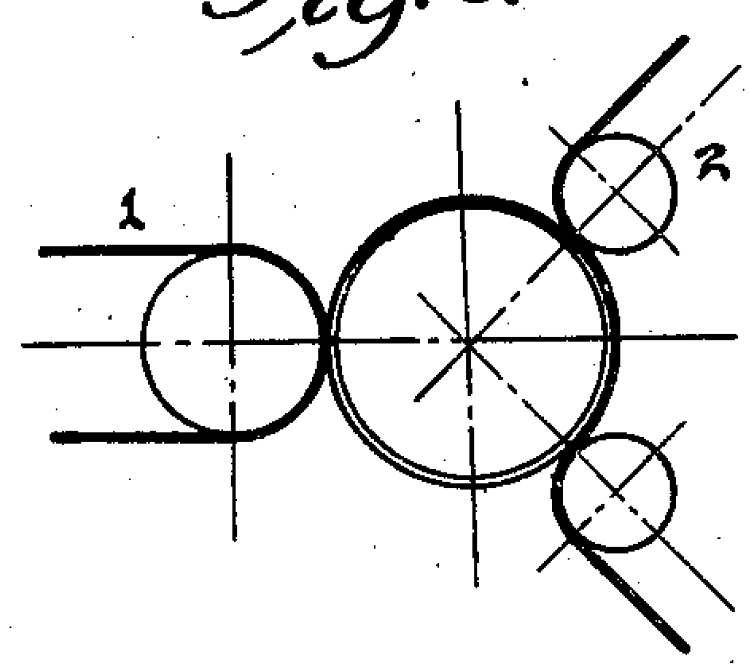


Fig. 7.

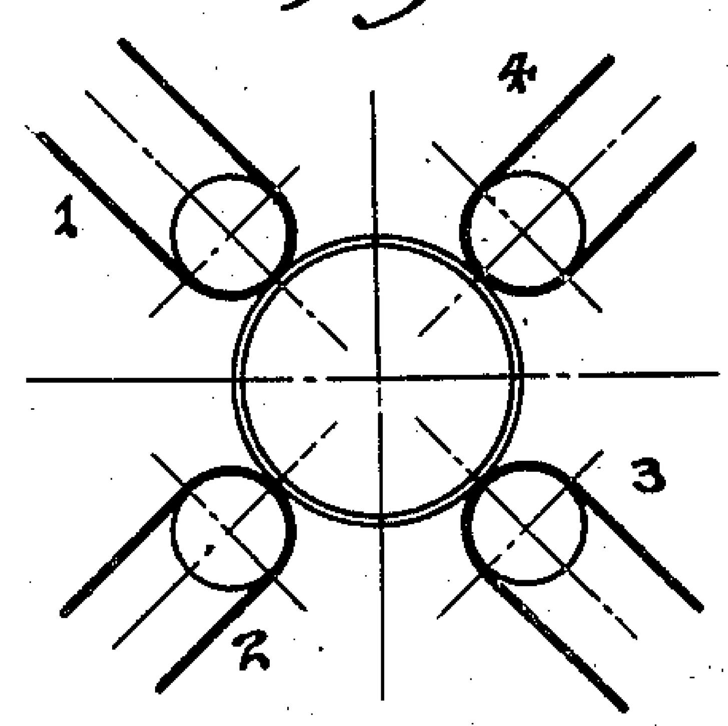


Fig. 8.

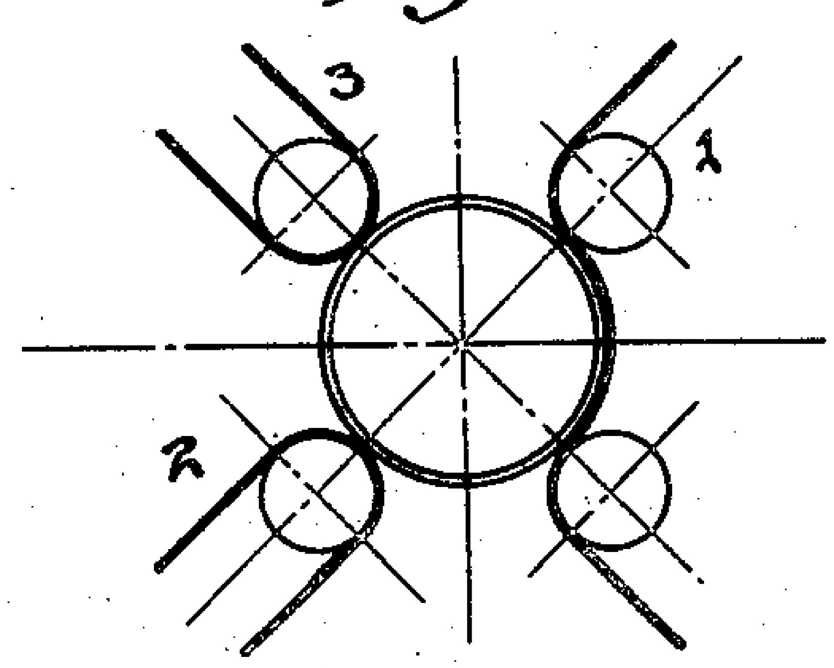


Fig. 9.

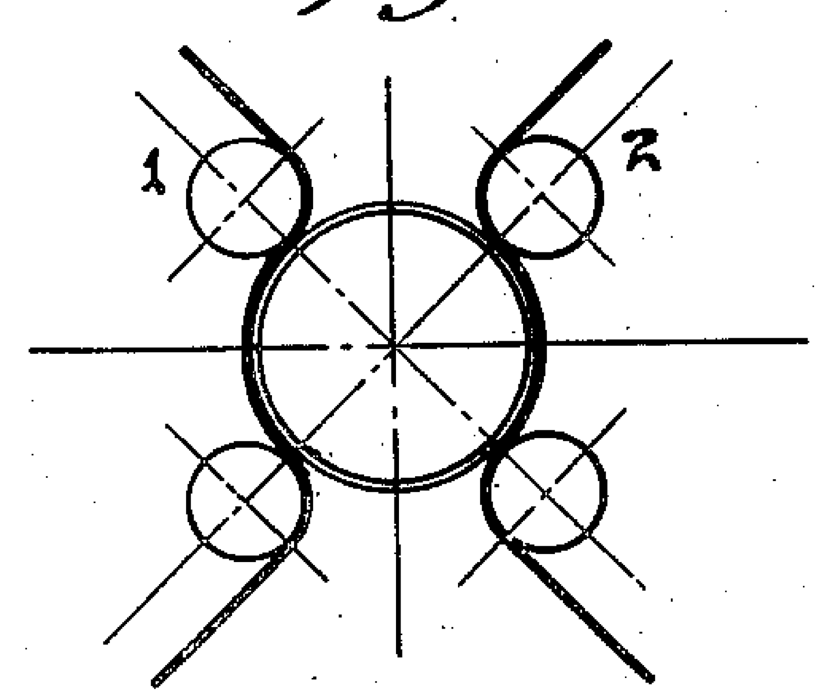


Fig. 10.

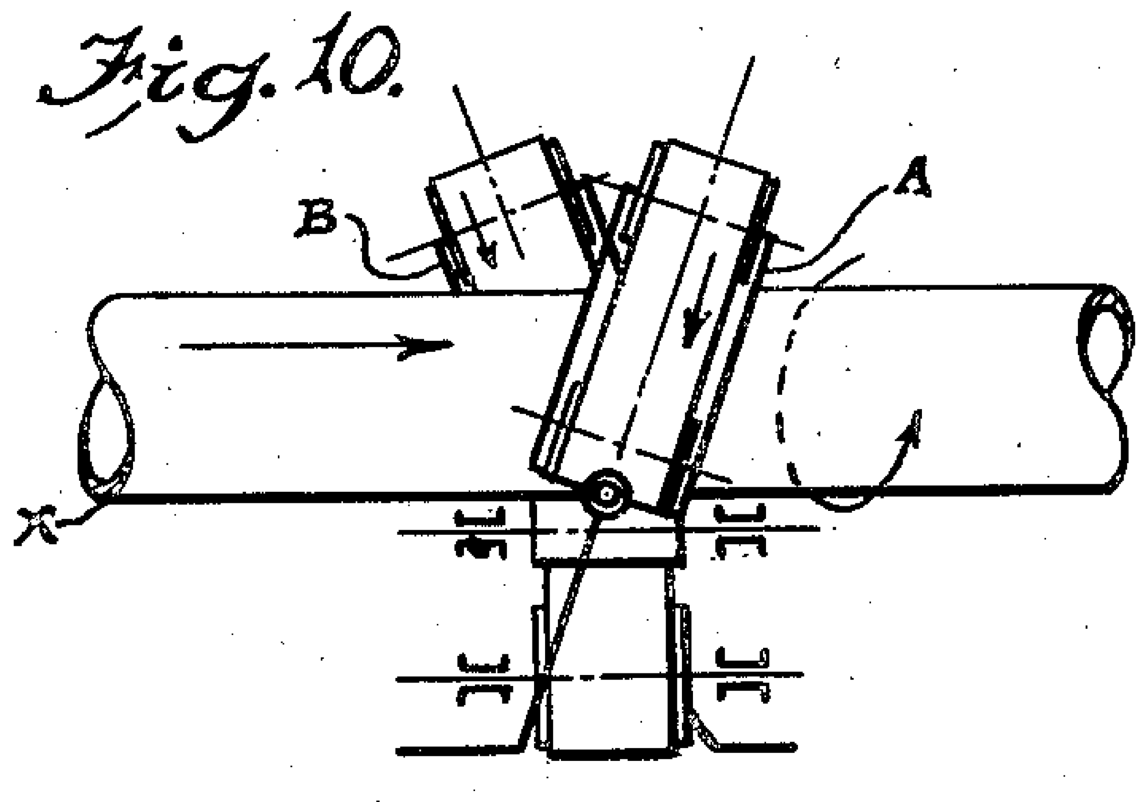


Fig. 11.

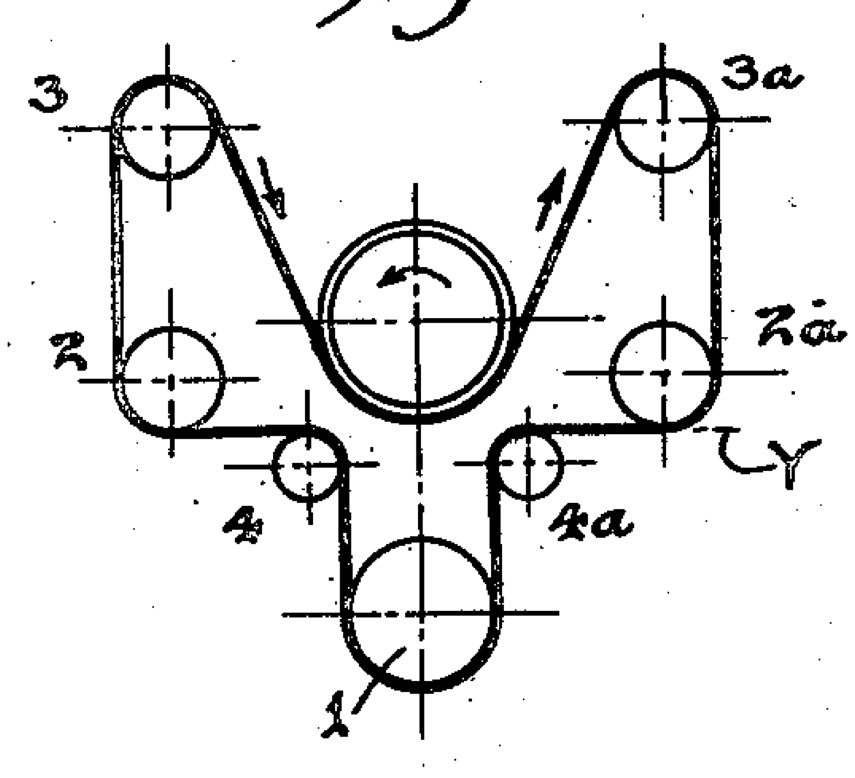
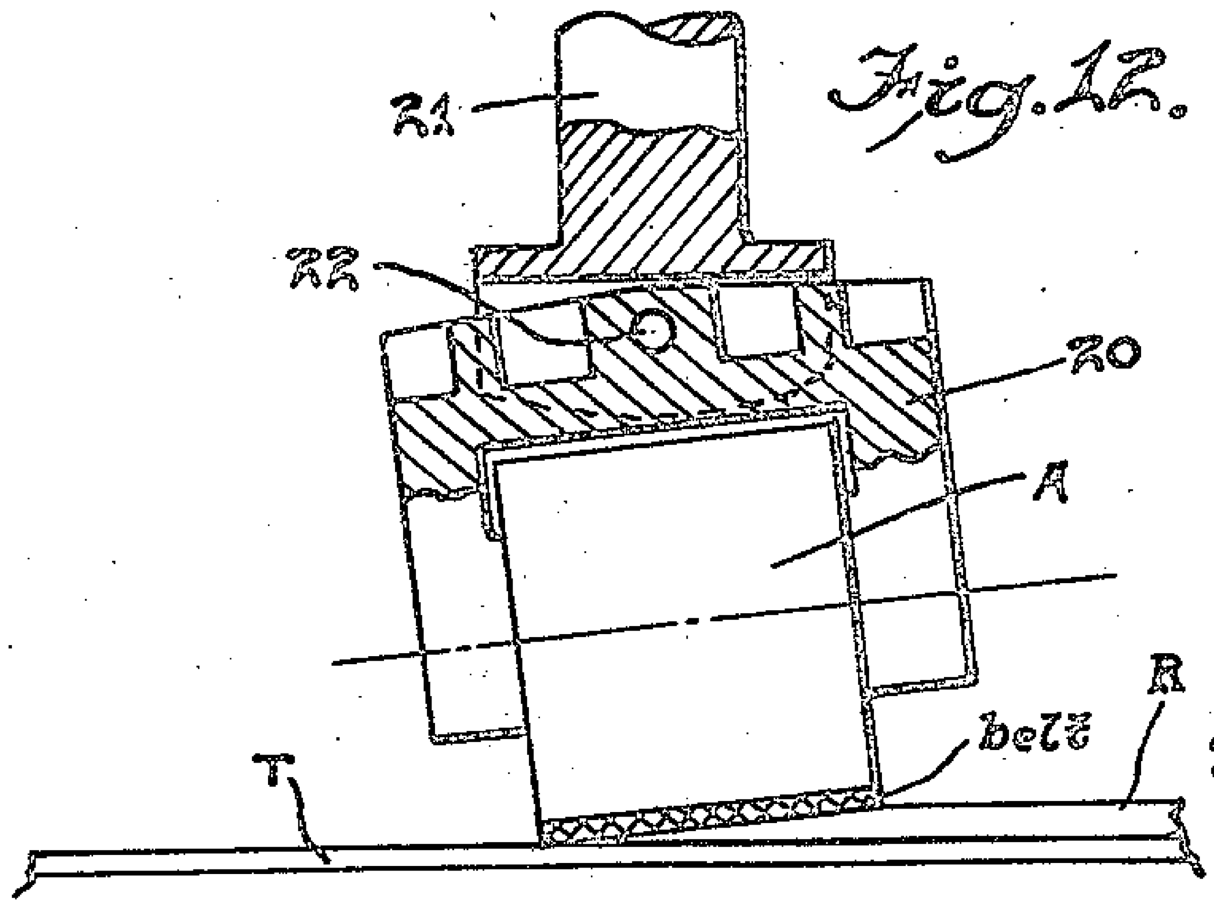


Fig. 12.



Inventor

A. Rocca,

By Emil Bönnelycke

Attorney

Patented Nov. 26, 1935 2,022,009

UNITED STATES PATENT OFFICE

2,022,009

MACHINE FOR COATING METALLIC CORES WITH CEMENT PLASTER BY SPIRAL WINDINGS, PROVIDED WITH DEVICES TO REGULATE THE FORMING AND CONVEYING ROLLERS AND BELTS

Agostino Rocca, Dalmine, Italy

Application January 3, 1933, Serial No. 650,004
In Italy July 11, 1930

15 Claims. (Cl. 91—34)

The present invention relates to a machine for coating metal cores with a cement plaster, for instance with a plaster of cement and asbestos. More particularly, the present invention relates to a machine of the kind comprising means for rotatably carrying a tubular or cylindrical metal core, a conveyor belt adapted to feed the cement plaster so as to enable it to be wound helically on said metal core, means preferably consisting of two or more pressure rollers for compacting the coating of cement plaster as it is applied, and means for driving positively either the metal core or the conveyor belt or one or more pressure rollers.

If on the one hand it is desired to produce with the aid of a machine of this kind a coated metal tube, cement plaster is wound helically on a tubular core to form a coating which is compacted by means of the pressure rollers or other compacting means. If on the other hand it is desired to produce a tube of plaster, the procedure is the same except for the addition of the final step of withdrawing the core from the compacted plaster coating which forms the finished tube. It is obvious that in this latter case the core may be either cylindrical or tubular.

The object of the present invention is to provide a machine of the kind set forth, in which the action of the pressure rollers or other compacting means is distributed more evenly over the surface of the coating while the latter is being formed than has hitherto been possible.

This object is attained according to the present invention in that the pressure rollers or other compacting means are carried by articulated forks.

In the drawings:—

Figure 1 is a fragmentary cross-section of a known arrangement with two rollers,

Fig. 2 illustrates an arrangement according to the present invention with two rollers mounted on pivoted forks,

Fig. 3 is a diagrammatic view of one form of automatic centering device,

Fig. 4 illustrates another form of automatic centering device,

Figs. 5 to 9 are diagrammatic views of various arrangements of rollers in devices for automatic centering having several rollers, and

Figs. 10 and 11 are, respectively diagrammatic side and sectional views of a form of cradle support capable of taking up the same inclination as the formation rollers.

Fig. 12 is a fragmentary detail view partly in section of the means for mounting the roller carrying forks.

In known machines, the deposition of the plaster on the metallic core may be carried out by means of "couple winding" devices or else by means of "contact" devices. The term "couple winding" is used to describe devices and arrangements in which the conveyor belt partly embraces the core so that there is a permanent area of contact between the belt and the core (see for example Fig. 9), while the term "contact" is used to describe devices and arrangements in which there is only a line contact between the conveyor belt and the core (see for example Figs. 3, 5, and 7).

In the second case, the device may comprise two rollers placed diametrically opposite with respect to the tube. Both rollers may be directly driven (in which case the peripheral velocities must be absolutely equal). If desired, two similar rollers may be used of which one is driven directly by any mechanism, hydraulic or mechanical, and the other is loose and only has the function of applying the desired pressure to the coating. Nevertheless, the axes of the rollers in the contact device lie in two vertical planes, parallel to the axis of rotation of the metallic tube T, to be coated. Since in the portion under the action of the rollers, the deposit of the mixture in layers makes the thickness of the coating R assume a conical form, it follows that, in the arrangement mentioned, the distribution of pressure is not equal throughout the whole length of the portion being formed (Fig. 1) because at the extremity where, from the conical form, the thickness has its least value, the pressure per unit of area becomes notably inferior to that at the other extremity.

It has been proposed to lessen this irregularity of pressure distribution, which occurs at the two extremities of a roller, by covering the roller with some pliant and elastic material V, such as rubber, felt or the like, but an irregularity in the distribution of pressure is always encountered with a consequent tendency for the coating to slip and part from the metallic surface of the tube.

By making use of rollers carried on forks loosely mounted, the object of avoiding the above deplorable troubles is attained. In fact, as Fig. 2 shows, the pressure exerted by the rollers, whether driven or loose, is distributed equally over every point of the contact producer *a—a*. The loose joint S may be applied either externally to the roller-supporting fork or internally in the body of the roller itself. In Fig. 12 there is shown means of articulatingly mounting the fork carrying the rollers A. As shown, roller A is carried by a fork **20** articulated to a support **21** by means of a pin **22**. These rollers are preferably covered with some elastic covering (rubber or the like) so that the roller may, during molding, better follow any possible superficial irregularities of the metallic tube to be coated.

It sometimes happens that irregularities of formation are produced owing to unsymmetrical working of the supports. This trouble may be eliminated by a system of automatic centering for the formation device. The axis of rotation of the metallic tube being fixed, it is necessary, when mechanically mounting the two pressure rollers, whether both of these are driven or one is driven and the other not, or whether both are loose, to adopt a mounting device by means of which the position of the rollers and their advance radially and towards the tube may be equal, simultaneous, and perfectly symmetrical with respect to the axis of the tube itself.

This mounting must be suitably provided with an elastic arrangement (which may be by springs, dashpots or other similar means) in order to allow slight movement to each pressure roller so as to be able to follow the irregularities of the external diameter of the metallic tube to be coated, without, however, diminishing the pressure exerted by these rollers during molding, which pressure is given by forces P—P' (see Fig. 3) which generally is given by hydraulic pistons.

Fig. 3 shows diagrammatically the system of automatic centering. Springs B—B' (which may be placed at any point of the system) provide the elasticity allowing slight movements of the molding rollers A A'.

In Fig. 4, however, there is shown another method of carrying out the automatic centering system in which the following principles are taken into account.

1. The axis of the core-tube to be coated must be fixed and invariable, whatever its diameter.

2. The three rollers which effect the automatic centering must act simultaneously on the core tube, and, therefore, must be positively interconnected, with interposed elastic members allowing slight movements of the rollers themselves, which, also, must be loosely mounted to adapt themselves to the conical surfaces of the mixture as has already been precisely defined.

3. The pressure which the three rollers apply to the core-tube must be directed along radial lines and symmetrically. Since the diameter of the core-tube varies through a somewhat large range, it is necessary to have the thrust of the rollers acting radially whatever may be the diameter of the tube. This moreover, should be obtained by means which are not complicated, since the change of diameter may occur rapidly. Again, in this action the pressure is not applied along the "generator" of the core-tube to be covered but really at the tangent-point between the rollers and the tube, that is, at points placed along the spiral line of the covering.

As has already been said, the moulding pressure on the mixture, besides being transmitted by the three auto-centered rollers proper, is also transmitted by the lateral supports.

In the annexed drawings, a device is shown with three rollers having the characteristics above defined.

The roller A, around which passes a belt carrying the mixture of cement plaster to be applied to the surface of the core, and the two counter-pressure and automatic centering rollers N, N' are mounted on a system of levers and connecting rods provided with suitable elastic members B, B'. Thus, within practical limits and regardless of the diameter of the core tube, the simultaneous application of the pressure of the three rollers in a substantially radial direction is assured. This substantially radial action, which within practical limits is independent of the dimensions of the core tube, is obtained in the following manner:

The two rollers N N' are carried on arms F F' pivotally mounted on bolts G G' with which are connected two quadrant-levers D D' which can rotate around their other extremity E. The rotary movement of arms F F' around points G G' is limited since the ends H H' of these arms must rotate around centers I I'.

These various movements of rotation, combined with the transitory movement of the connecting rods L L', connected with the angle of the levers D D', and moved in their turn by some force (hydraulic pressure or other means) applied at the points M M', cause the rollers N N', for any diameter of the core-tube, always to act radially with respect to this tube whose axis remains fixed and invariable.

The deposition of the mixture of asbestos and cement onto a metallic tube may also be obtained more regularly by employing the auto-centering device with many rollers. This system is analogous to the usual auto-centering system, but a substitution of rollers for the gripping stocks or jaws generally used is made. This device is formed with two distinct formation heads each having one or more molding rollers 1, 2, 3, 4. All these rollers must exert a pressure on the coating along axes radial to the tube to be coated, since, if this force does not pass through the center of rotation of the tube, rotation couples will be set up which will endanger the coating. The rollers may be covered with an elastic material, such as rubber, felt, or the like. Figs. 5 to 9 illustrate diagrammatically various arrangements of rollers for automatically centering the core.

Fig. 5 shows an arrangement consisting of three radially acting contact rollers 1, 2, and 3 between which the core is automatically centered.

Fig. 6 shows an arrangement consisting of a contact roller 1 and a couple winding device 2 comprising two radially acting rollers.

Fig. 7 shows an arrangement consisting of four symmetrically disposed radially acting contact rollers 1, 2, 3, and 4.

Fig. 8 shows an arrangement consisting of two contact rollers 2 and 3 and a couple winding device 1 comprising two radially acting rollers.

Fig. 9 shows an arrangement consisting of two couple winding devices 1 and 2, each comprising two radially acting rollers.

It should be noted, however, that by constructing the machine with great precision and reducing as far as possible causes of friction, it is possible to use for molding one roller driven and the other loose. This system may then be applied in the arrangement of the "head with many rollers", as mentioned above.

In known machines the use of supporting rollers has already been proposed, which, by means of rods sliding in cylinders and with the aid of some elastic means (generally fluid under compression), would cause these rollers to adhere continuously to the surface of the tube to be coated. In that form of support, in order to convert radial friction to rolling friction at the extremities of the rods mentioned, small rollers are loosely mounted and covered with an elastic material which comes directly into contact with the surface of the tube, taking on a rotary movement around their axes, caused by the rotation of the tube itself. Moreover, these rollers are mounted so as to be able always to assume an inclination rendering them tangential to the covering spiral at the point of contact. When dealing with tubes having a large diameter, there would be an excessive pressure on the rollers and therefore a possibility of danger to the plastic surface being formed would arise. This trouble may be avoided by the use of supplementary belts mounted on adjustable pulleys, and having the duty of supporting the tube during its formation. Such new arrangements present special advantages when dealing with the covering or manufacture of tubes of large diameter. Moreover the use of these arrangements allow the following operations to be carried out with great facility:—

(*a*) Introducing the mandrel into the machine,

(*b*) Extracting the finished tube from the machine,

(*c*) Giving rotary and transitional movement to the tube, aiding that given by the main belt and lessening the strain on the belts and that tangential to the plaster in the formation zone. Figs. 10–11, represent, diagrammatically, the resulting arrangement.

In this arrangement, rollers **2**, **3** and **2*a***, **3*a*** should be mounted loose on their axes and inclinable with regard to the axis of the tube, to give this a rotary and axial-transitional movement. For this purpose it is advisable to turn the mountings A and B towards the axis X—Y thus inclining rollers and belt with respect to the axis of the tube. Rollers **4**, **4*a***, are fixed and serve as return pulleys and guides. Roller **1**, also fixed, may be mounted loose on its axis or it may be driven. In the latter case it serves to give rotary and axial-transitional movement to the tube, thus reducing the labor both of the supporting belt and of the main driving belt of the machine. Moreover, it gives to the supporting belt, a greater velocity than that possessed by the main belt. The supporting belt serves also to move the tube further from, or nearer to the machine. Naturally by altering the inclination of the mountings A and B, the axial transitional movement is altered, and by inverting, or changing the sense of, the inclination of the aforesaid mountings, the axial-transitional movement is reversed.

Various products can be made with the apparatus herein described. Metal tubes provided with protective or decorative coatings of cementitious material applied by the apparatus of the present invention may be employed as constructional elements in the building arts. The cementitious bodies formed on the metal tubes may also be used in the building arts after removal of the mandrel or molding core (metal tube). Of course, the products made according to the present invention are not limited to the above-described uses.

Naturally the arrangements described and shown diagrammatically in the annexed drawings should be carried out, in practice, with mechanism suitable to the different types of machines to which they would be applied. Moreover, in such machines there might be introduced one or more of the aforesaid arrangements, without departing from the scope of the invention.

What I claim is:

1. A machine for covering the outer surface of a cylindrical core with a plastic material, comprising means for rotatably supporting the cylindrical core, means for applying the plastic material to the outer surface of the core, a plurality of articulated forks, a plurality of rollers carried by the articulated forks for engaging and compacting the applied coating on the cylindrical core while being wound thereon, and mechanism interconnecting the articulated roller-carrying forks for effecting simultaneously symmetrical and substantially equal movements of the forks and the rollers carried thereby in directions toward the axis of the core.

2. A machine for covering the outer surface of a cylindrical core with a plastic material, comprising means for rotatably supporting the cylindrical core, means for applying the plastic material to the outer surface of the core, a plurality of articulated forks, a plurality of rollers carried by the articulated forks for engaging and compacting the applied coating on the cylindrical core while being wound thereon, mechanism interconnecting the articulated roller-carrying forks for effecting simultaneously symmetrical and substantially equal movements of the forks and the rollers carried thereby in directions toward the axis of the core, and elastic means provided in the interconnecting mechanism to permit slight independent movement of each roller to compensate for small irregularities in the coating.

3. A machine for covering the outer surface of a cylindrical core with a plastic material, comprising means for rotatably supporting the cylindrical core, means for applying the plastic material to the outer surface of the core, a plurality of articulated forks, a plurality of rollers carried by the articulated forks for engaging and compacting the applied coating on the cylindrical core while being wound thereon, and a separate conveyor belt passing around each of said pressure rollers.

4. A machine for covering the outer surface of a cylindrical core with a plastic material, comprising means for rotatably supporting the cylindrical core, means for applying the plastic material to the outer surface of the core, a plurality of articulated forks, a plurality of rollers carried by the articulated forks for engaging and compacting the applied coating on the cylindrical core while being wound thereon, mechanism interconnecting the articulated roller-carrying forks for effecting simultaneously symmetrical and substantially equal movements of the forks and the rollers carried thereby in directions toward the axis of the core, and a separate conveyor belt passing around each of said pressure rollers.

5. A machine for covering the outer surface of a cylindrical core with a plastic material, comprising means for rotatably supporting the cylindrical core, means for applying the plastic material to the outer surface of the core, a plurality of articulated forks, a plurality of rollers carried by the articulated forks for engaging and compacting the applied coating on the cylindrical core while being wound thereon, mechansm interconnecting the articulated roller-carrying forks for effecting simultaneously symmetrical and substantially equal movements of the forks and the rollers carried thereby in directions toward the axis of the core, elastic means provided in the interconnecting mechanism to permit slight independent movement of each roller to compensate for small irregularities in the coating, and a separate conveyor belt passing around each of said pressure rollers.

6. A machine for covering the outer surface of a cylindrical core with a plastic material, comprising means for rotatably supporting the cylindrical core, means for applying the plastic material to the outer surface of the core, a plurality of articulated forks, a plurality of rollers carried by the articulated forks for engaging

and compacting the applied coating on the cylindrical core while being wound thereon, there being at least three of said rollers distributed symmetrically about the periphery of the core, automatic centering devices for controlling the application of said rollers to the coated core, and a separate conveyor belt passing around each of said pressure rollers.

7. A machine for covering the outer surface of a cylindrical core with a plastic material, comprising means for rotatably supporting the cylindrical core, means for applying the plastic material to the outer surface of the core, a plurality of articulated forks, a plurality of rollers carried by the articulated forks for engaging and compacting the applied coating on the cylindrical core while being wound thereon, and a conveyor belt passing around two adjacent pressure rollers and embracing a portion of the coating on the core between the lines of contact between said pressure rollers and said coating.

8. A machine for covering the outer surface of a cylindrical core with a plastic material, comprising means for rotatably supporting the cylindrical core, means for applying the plastic material to the outer surface of the core, a plurality of articulated forks, a plurality of rollers carried by the articulated forks for engaging and compacting the applied coating on the cylindrical core while being wound thereon, mechanism interconnecting the articulated roller-carrying forks for effecting simultaneously symmetrical and substantially equal movements of the forks and the rollers carried thereby in directions toward the axis of the core, and a conveyor belt passing around two adjacent pressure rollers and embracing a portion of the coating on the core between the lines of contact between said pressure rollers and said coating.

9. A machine for covering the outer surface of a cylindrical core with a plastic material, comprising means for rotatably supporting the cylindrical core, means for applying the plastic material to the outer surface of the core, a plurality of articulated forks, a plurality of rollers carried by the articulated forks for engaging and compacting the applied coating on the cylindrical core while being wound thereon, there being at least three of said rollers distributed symmetrically about the periphery of the core, automatic centering devices for controlling the application of said rollers to the coated core, and a conveyor belt passing around two adjacent pressure rollers and embracing a portion of the coating on the core between the lines of contact between said pressure rollers and said coating.

10. A machine for covering the outer surface of a cylindrical core with a plastic material, comprising means for rotatably supporting the cylindrical core, means for applying the plastic material to the outer surface of the core, a plurality of articulated forks, a plurality of rollers carried by the articulated forks for engaging and compacting the applied coating on the cylindrical core while being wound thereon, and means for guiding the rollers to and from the coated core along radii of said core independently of the diameter of the core.

11. A machine for covering the outer surface of a cylindrical core with a plastic material, comprising means for rotatably supporting the cylindrical core, means for applying the plastic material to the outer surface of the core, a plurality of articulated forks, a plurality of rollers carried by the articulated forks for engaging and compacting the applied coating on the cylindrical core while being wound thereon, and a plurality of pivoted quadrant levers pivotally connected to said forks for guiding them in their movement toward and from said core.

12. A machine for covering the outer surface of a cylindrical core with a plastic material, comprising means for rotatably supporting the cylindrical core, means for applying the plastic material to the outer surface of the core, a plurality of articulated forks, a plurality of rollers carried by the articulated forks for engaging and compacting the applied coating on the cylindrical core while being wound thereon, and a plurality of pivoted quadrant levers pivotally connected to said forks for guiding them in their movement toward and from said core, said quadrant levers being pivoted about a common fixed axis.

13. A machine for covering the outer surface of a cylindrical core with a plastic material, comprising means for rotatably supporting the cylindrical core, means for applying the plastic material to the outer surface of the core, a plurality of articulated forks, a plurality of rollers carried by the articulated forks for engaging and compacting the applied coating on the cylindrical core while being wound thereon, said forks having arms, a pair of levers pivoted about a common axis, means for pivotally connecting the free ends of said levers to the arms of said forks at a point adjacent the roller, and means for connecting the ends of the arms remote from the rollers to spaced pivoted links, the length of the levers and links and the position of the links being so adjusted as to confine movement of the rollers in straight line paths toward the axis of the core.

14. A machine for covering the outer surface of a cylindrical core with a plastic material, comprising means for rotatably supporting the cylindrical core, means for applying the plastic material to the outer surface of the core, a plurality of articulated forks, a plurality of rollers carried by the articulated forks for engaging and compacting the applied coating on the cylindrical core while being wound thereon, said forks having arms, a pair of levers pivoted about a common axis, means for pivotally connecting the free ends of said levers to the arms of said forks at a point adjacent the roller, means for connecting the ends of the arms remote from the rollers to spaced pivoted links, the length of the levers and links and the position of the links being so adjusted as to confine movement of the rollers in straight line paths toward the axis of the core, and means for effecting simultaneous movement of said levers.

15. A machine for covering the outer surface of a cylindrical core with a plastic material, comprising a pair of rollers mounted on horizontally spaced axes, a belt passing over said rollers and adapted to provide a cradle between the spaced rollers for supporting said core, articulated forks carrying said rollers, said articulated forks being capable of inclination to cause the belt to follow the contour of the surface of the core.

AGOSTINO ROCCA.