G. HORN AND E. STÖCKEMANN.

BRAIDING MACHINE.

APPLICATION FILED JUNE 1, 1917.

1,409,298.

Patented Mar. 14, 1922.

4 SHEETS—SHEET 1.

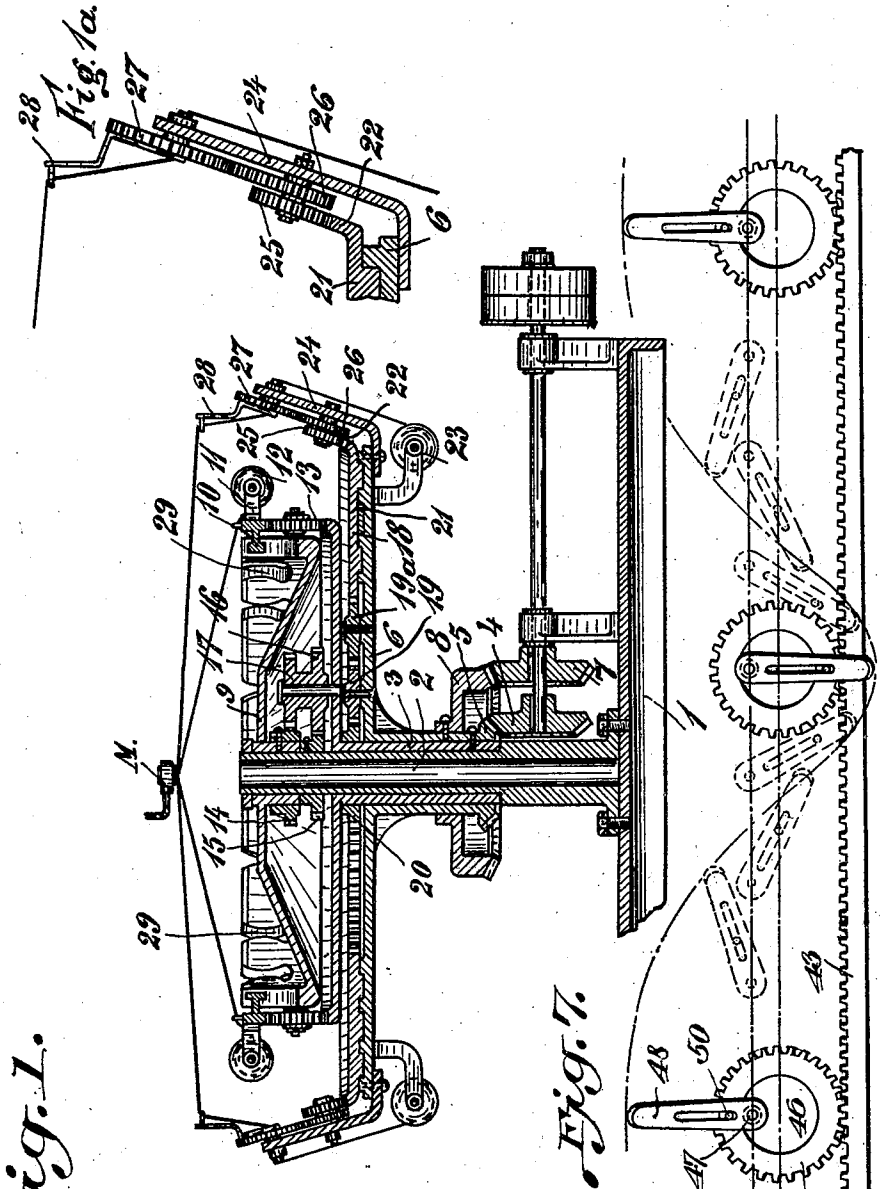


Fig. 1.

Fig. 7.

Inventors:-
Guido Horn and
Ernst Stöckemann,
By:- B. Singer, Atty

G. HORN AND E. STÖCKEMANN.

BRAIDING MACHINE.

APPLICATION FILED JUNE 1, 1917.

1,409,298. Patented Mar. 14, 1922.

4 SHEETS—SHEET 2.

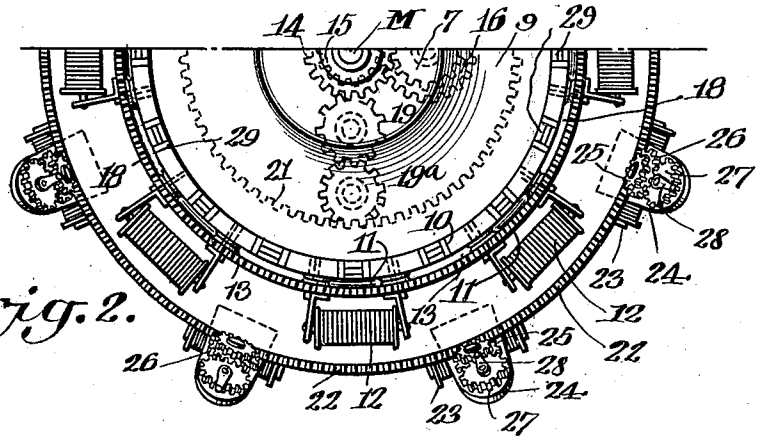


Fig. 2.

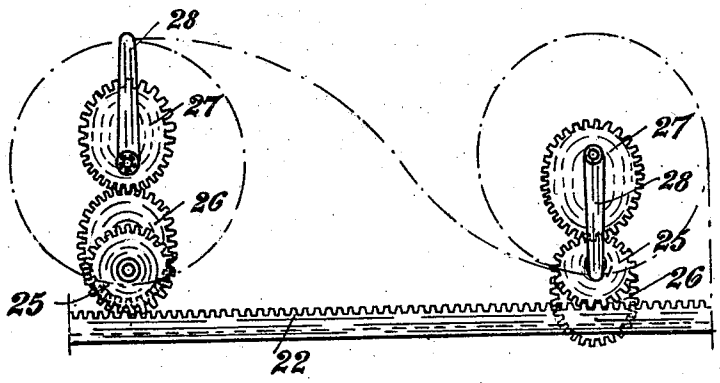


Fig. 3.

Inventors:-
Guido Horn and
Ernst Stöckemann,
By:- B. Singer,
Atty.

G. HORN AND E. STÖCKEMANN.

BRAIDING MACHINE.

APPLICATION FILED JUNE 1, 1917.

1,409,298.

Patented Mar. 14, 1922.

4 SHEETS—SHEET 3.

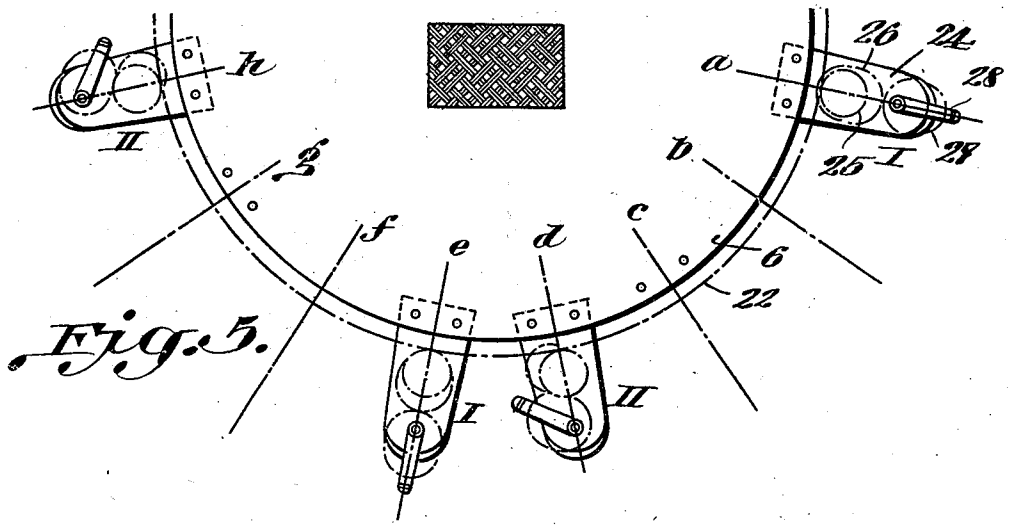


Fig. 5.

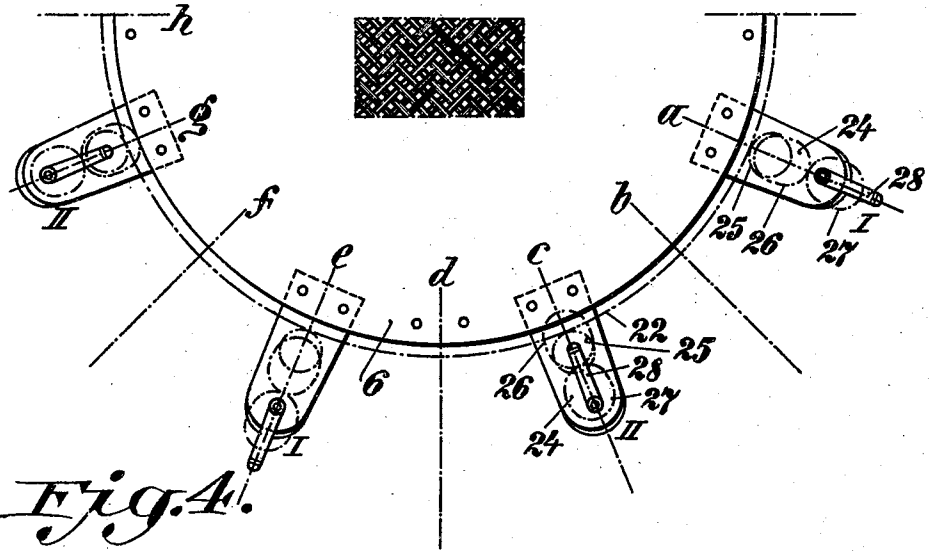


Fig. 4.

Inventors:-
Guido Horn and
Ernst Stöckemann,
By:- B. Singer Atty.

G. HORN AND E. STÖCKEMANN.

BRAIDING MACHINE.

APPLICATION FILED JUNE 1, 1917.

1,409,298.

Patented Mar. 14, 1922.

4 SHEETS—SHEET 4.

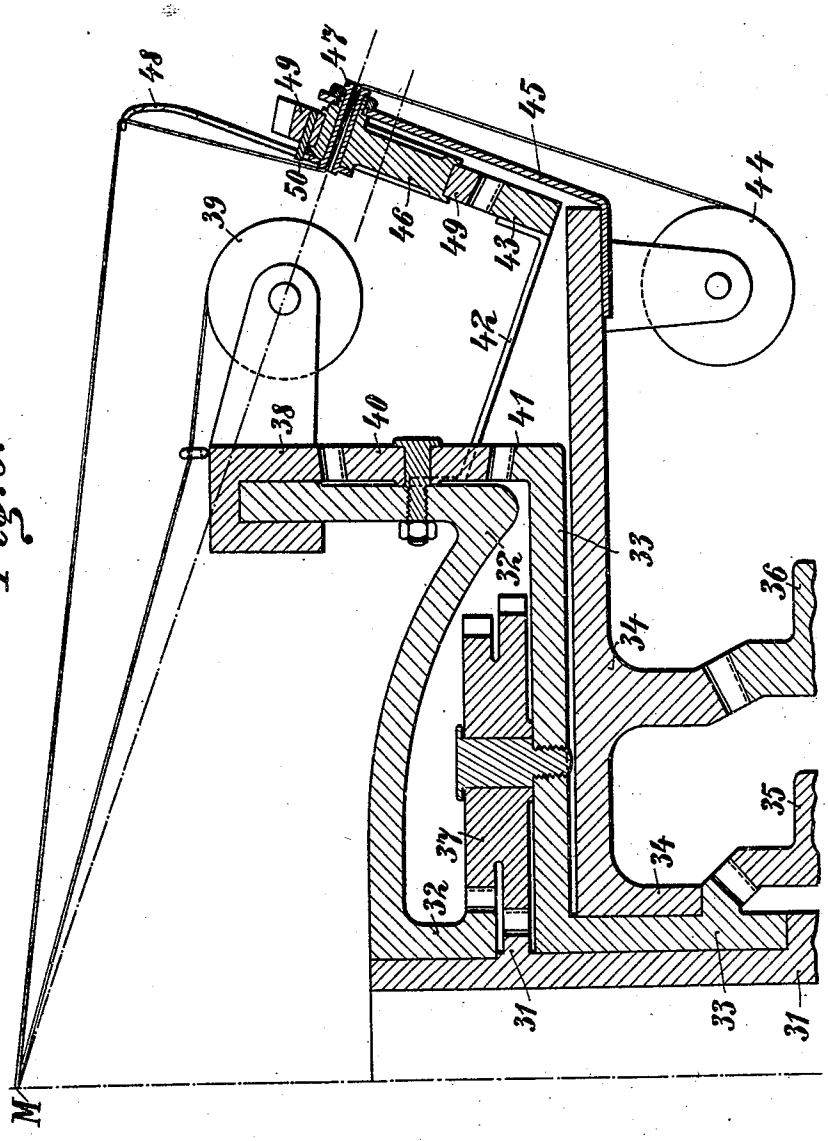


Fig. 6.

Inventors:-
Guido Horn and
Ernst Stöckemann,
By:- B. Singer, Atty.

UNITED STATES PATENT OFFICE.

GUIDO HORN AND ERNST STÖCKEMANN, OF WEISSENSEE, BERLIN, GERMANY.

BRAIDING MACHINE.

1,409,298. Specification of Letters Patent. Patented Mar. 14, 1922.

Application filed June 1, 1917. Serial No. 172,305.

(GRANTED UNDER THE PROVISIONS OF THE ACT OF MARCH 3, 1921, 41 STAT. L., 1313.)

To all whom it may concern:

Be it known that we, GUIDO HORN, residing at Weissensee, Berlin, Germany, and ERNST STÖCKEMANN, residing at 18 Siemens St., Berlin, Germany, subjects of the German Emperor, have invented new and useful Improvements in Braiding Machines, of which the following is a specification.

This invention relates to machines for producing braidings on round bodies in which the threads paid out from the outer series of bobbins are guided by thread guiding wheels along cycloid tracks traced upon a concave spherical surface. An object of the invention is to avoid the drawback that is coupled with the guiding of the outer threads along cycloid paths and which exists in machines now in use being unadapted for the production of braidings which consist of pairs of threads and in which each pair of threads running in one direction passes over and under consecutive pairs of threads running in the other direction as in the style of braid shown in Fig. 5 of this specification, this style of braid being desirable for many purposes. With the machine now in use it is also impossible to guide or switch the threads of two consecutive travelling bobbins in the manner required for producing the whiplash style of braiding illustrated in Fig. 4 of the accompanying drawing. Previous attempts to accomplish this object by the insertion of groups of thread-guiding wheels have in one case resulted in a machine that is not capable of economical production and in another case the path of the thread leading to the thread guide becomes too inaccessible and the machine too costly for commercial use.

The desired end is accomplished in the present invention by providing rotating thread guides that alter their angular speed so that the outer thread may be kept in its lower position long enough to enable two inner threads to glide over it. During the interval in which the outer thread is kept in the lower position it dips down into an indentation between two sections of the runway along which the carriers of the inner thread bobbins travel. As the outer thread continues rotating towards the approaching inner thread whilst it (the outer thread) is kept in the indentation, the runway support with the said indentation is made to execute a motion in the same direction as the outer thread.

Two devices for accomplishing the varying angular speed of the thread guides are hereinafter described, the first comprising elliptical thread guiding wheels, whilst the second device constitutes thread guide levers that revolve on pivots arranged eccentrically in their driving wheels.

The invention is illustrated in the accompanying drawing in which Figs. 1 to 5 represent one method of executing the machine and Figs. 6 and 7 a modification.

Fig. 1 is a vertical section of the machine,

Fig. 1^a a group of thread guiding wheels on an enlarged scale,

Fig. 2 a view of one half of the machine seen from above,

Fig. 3 illustrates a group of thread guiding wheels and the path described by the thread guided by these wheels, whilst

Figs. 4 and 5 show two different modes of grouping the thread guiding wheels and the corresponding styles of braiding produced thereby.

Fig. 6 shows one half of the principal parts of a modified machine in vertical section and

Fig. 7 illustrates the path described by an outer thread in the modified machine.

In Fig. 1 a hollow vertical column or pivot 2 is mounted on the foundation plate 1. Revolving about the pivot 2 is an inner rotor 3, an outer rotor 6 and a runway rotor 9 the upwardly turned periphery of which forms a runway 10 along which the bobbin carriers 11 glide that carry the inner bobbins 12. The outer rotor 6 carries the outer bobbins 23 and the guide wheels 26, 27 for the outer threads. Intermediate wheels 13 are pivotally mounted on the runway rotor 9 which transfer motion to the inner bobbin carriers 11. A cogwheel 14 is fixed to the hub at the lower side of the runway rotor and another cogwheel 15 is attached to the stationary column 2. The wheel 15 meshes with a gear wheel 16 that is rigidly fixed to another gear wheel 17 which engages with the wheel 14.

The inner rotor 3 is rotated by the driving shaft with the aid of the bevel wheels 4 and 5. Its periphery takes the shape of a circle 18 of upwardly pointing teeth that engage with the intermediate wheels 13.

Revolubly mounted on its upper surface is the aforesaid pair of wheels 16 and 17 and fixed to its hub at its lower side is the toothed wheel 20. The outer rotor 6 is revolved by the bevel wheels 7 and 8. Revolubly mounted on the upper side of the outer rotor are the intermediate gear wheels 19 and 19ª, the wheel 19 meshing with the toothed wheel 20. An annular middle rotor 21 with internal gearing is revolubly mounted on the upper surface of the outer rotor 6, the middle rotor being concentric to the pivot 2. The internal gearing of the middle rotor engages with the gear wheel 19ª. The periphery of the middle rotor is shaped in the form of a bevel wheel with upwardly pointing teeth 22.

The outer bobbins 23 are suspended from the under side of the outer rotor 6. This rotor also carries the upright supports 24, which bear the pinions 25 and the pairs of elliptical toothed wheels 26 and 27. The pinions 25 are driven by the circle of teeth 22 and are fixed to the elliptical wheels 26. The elliptical wheels 27 carry the thread guides 28 the hollow axes of which form passages for the threads from the outer bobbins 23.

The runway 10 on the runway rotor 9 has indentations 29 into which the outer threads are dipped down when in their lowest positions. The braiding point M is the point of intersection of the lines drawn through the central axes of the elliptical wheels 27.

The operation of the machine is as follows:

The rotors 3 and 6 are driven in the same direction but at different speeds by the bevel wheels 4 and 7. The outer bobbins 23 rotate with the outer rotor 6. The circle of teeth 18 of the inner rotor 3 meshes with the intermediate wheels 13 and these drive the inner bobbin carriers 11 with the bobbins 12 at the same speed as the inner rotor in the opposite direction.

The toothed wheels 20, 19 and 19ª are geared with the internal gearing of the toothed middle rotor 21 so as to produce a greater speed of rotation than the outer rotor 6. This results in the rotation of the pinion 25 and in a turning of the elliptical wheel 27, the rotation of this wheel corresponding to a forward rolling motion in the direction of rotation of the outer rotor 6.

During the rotation of the inner rotor 3 the cogwheel 16 rolls over the teeth of the fixed wheel 15. It transfers its rotary motion to its associated wheel 17 and this wheel imparts with the aid of the wheel 14, the amount of forward rotary motion to the runway rotor 9 which is necessary to enable the indentations 29 to take up the outer threads whilst the inner bobbins are passing over them.

The threads from the inner bobbins pass direct from the bobbins to the braiding point M. The threads from the outer bobbins 23 are led through the hollow axes of the elliptic wheels 27 and through the eyes of the thread guides 28, whence they pass to the braiding point. In the present case the speed of rotation of the wheels 27 is arranged so that the outer threads pass over two inner threads and then under two inner threads alternately. Neighboring groups of thread guide wheels may be set so that each pair of threads in one direction passes over and under alternate pairs running in the other direction or so that a whiplash braiding results. Figures 4 and 5 show the manner of setting the outer thread guides and the corresponding types of braiding produced.

As shown in Fig. 4, a whiplash style of braiding is produced by grouping the rotating thread guides altering their angular speed equidistantly around the periphery of the rotor, so that alternating thread guides I are in their outer, and guides II in their inner positions, while in the production of the style of braid shown in Figure 5, they are grouped in pairs and the groups are equidistant from each other, while the thread guides of I are in their outer, and of II in their inner positions (three quarter).

The four machine parts 3, 6, 9 and 21 travel in the same direction at different speeds. In the machine described two rotors are driven direct by the driving shaft. It will be apparent that all of the rotors may derive their motion from one direct drive or that several rotors may each be driven direct.

In the modification shown in Figs. 6 and 7 a simpler form of outer thread guide is employed. Instead of elliptical wheels a single annular toothed wheel 49 is employed in the fixed axis 46 of which the thread guide is revolubly mounted on an eccentric pivot 47 so that a varying angular speed of the thread guide results when the annular wheel rotates.

The runway rotor 32 and the inner rotor 33 rotate about the middle axis 31 and the outer rotor 34 revolves about the hub of the middle rotor 33. The outer and inner rotors 34, 33 are rotated at different speeds by bevel wheels 35 and 36. The pair of wheels 37 is turned with the rotor 33 about the axis 31, the lower wheel 37 rolling over a circle of teeth fixed to the axis 31 and the upper wheel 37 meshing with a circle of teeth fixed to the runway rotor 32 thus driving the runway rotor at a lower speed.

Bobbin carriers 38 with the inner bobbins 39 glide along the circular runway supported by the runway rotor, the carriers 39 being propelled in the opposite direction to the runway rotor and to the outer bobbins 44 by a circle of teeth 41 carried by the inner ro-

tor that mesh with intermediate wheels 40. Suspended from the runway rotor 32 are supports 42 that carry a circle of teeth 43. The rotor 34, from which the outer bobbins 44 are suspended, carries upright wheel supports 45 to which the large pivots or axes 46 are fixed. These axes have eccentric holes that take the hollow shafts 47 of the thread guides 48. By the motion of the circle of teeth 43 the annular wheels 49 are caused to rotate on their axes 46 and thread guides 48 are then rotated by propelling pins 50 in the annular wheels.

From the relative movements of an annular wheel and the thread guide associated therewith illustrated in Fig. 7 it will be seen that the thread guide lever that imparts the up and down movement to the outer thread is kept in its lower position a greater part of the time and also travels a shorter distance during this time. The consequence is that if a corresponding number of bobbins are provided the outer thread will be guided over and under each of two consecutive pairs of inner threads.

We claim:

1. A machine for producing braidings on round bodies comprising, an inner and outer circularly disposed series of thread supplies, carriers for the inner series of thread supplies, a runway for the said carriers, teeth on the said carriers, driving wheels revolubly mounted on the said runway and engaging with the carrier teeth, an inner rotor with a circle of teeth that engages with the said driving wheels, an outer rotor carrying the outer series of thread supplies, means for rotating the inner rotor at a greater speed than the outer rotor, and means for moving the said runway in the same direction as the outer rotor but at a slower speed.

2. A machine for producing braiding on round bodies comprising, an inner rotor, a runway, an outer rotor, intermediate wheels revolubly mounted on the runway, bobbin carriers rotated on the runway by the said inner rotor and the intermediate wheels, bobbins so mounted on the outer rotor that their axes all lie in one and the same plane, thread guides for guiding the threads from the outer bobbins to the braiding point of the machine, means for rotating the thread guides at varying angular speeds, and means for rotating the outer rotor in the opposite direction to the said carriers.

3. A machine for producing braiding on round bodies comprising an inner rotor, a runway, an outer rotor, intermediate wheels revolubly mounted on the runway, bobbin carriers rotated on the runway by the said intermediate wheels and the inner rotor, bobbins so mounted on the outer rotor that their axes all lie in one and the same plane, thread guides for guiding the threads from the outer bobbins to the braiding point of the machine, means for rotating the thread guides at varying angular speeds, means for rotating the outer rotor in the opposite direction to the said carriers and means for rotating the said inner rotor in the same direction as and faster than the outer rotor.

4. A machine for producing braiding on round bodies comprising, an inner rotor, a runway, an outer rotor, intermediate wheels revolubly mounted on the runway, bobbin carriers rotated on the runway by the said intermediate wheels and the inner rotor, bobbins so mounted on the outer rotor that their axes all lie in one and the same plane, thread guides for guiding the threads from the outer bobbins to the braiding point of the machine, means for rotating the thread guides at varying angular speeds, means for rotating the outer rotor in the opposite direction to the said carriers means for rotating the said inner rotor in the same direction as and faster than the outer rotor, and means for moving the said runway in the same direction as but slower than the outer rotor.

5. A machine for producing braiding on round bodies comprising, a runway, an inner rotor, a middle rotor, an outer rotor, intermediate wheels revolubly mounted on the runway, bobbin carriers rotated on the runway by the said intermediate wheels and the inner rotor, bobbins so mounted on the outer rotor that their axes all lie in one and the same plane, thread guides for guiding the threads from the outer bobbins to the braiding point of the machine, elliptic wheels for rotating the thread guides at varying speeds, a circle of teeth on the middle rotor, a pinion coupled to some of the elliptic wheels and engaging with the circle of teeth, means for rotating the outer rotor in the opposite direction to the said carriers, and means for rotating the middle rotor in the same direction as but faster than the outer rotor.

6. A machine for producing braiding on round bodies comprising, a circular runway, bobbin carriers travelling on the said runway, an inner rotor, a middle rotor, an outer rotor, bobbins attached to the outer rotor, elliptical wheels, pinions engaging with the said elliptical wheels, thread guides propelled at varying speeds by the elliptical wheels, the elliptical wheels and pinions being mounted on the outer rotor, a circle of teeth on the middle rotor engaging with the said pinions, means by which the inner rotor propels the bobbin carriers in the opposite direction to the outer rotor, and means for rotating the middle rotor at a higher speed than the outer rotor.

7. A machine for producing braiding on round bodies comprising, a circular runway, bobbin carriers travelling on the said run-

way, an inner rotor, a middle rotor, an outer rotor, bobbins attached to the outer rotor, elliptical wheels, pinions engaging with the said elliptical wheels, thread guides propelled at varying speeds by the elliptical wheels, the elliptical wheels and pinions being mounted on the outer rotor, a circle of teeth on the middle rotor engaging with the said pinions, means by which the inner rotor propels the bobbin carriers in the opposite direction to the outer rotor, means for rotating the middle rotor at a higher speed than the outer rotor, and means for moving the runway in the same direction as but at a slower speed than the outer rotor.

In testimony whereof I have affixed my signature in presence of two witnesses.

GUIDO HORN.
ERNST STÖCKEMANN.

Witnesses:
L. BELS,
T. GEIER.