May 13, 1924. 1,493,782

F. KLEIN

BRAIDING MACHINE

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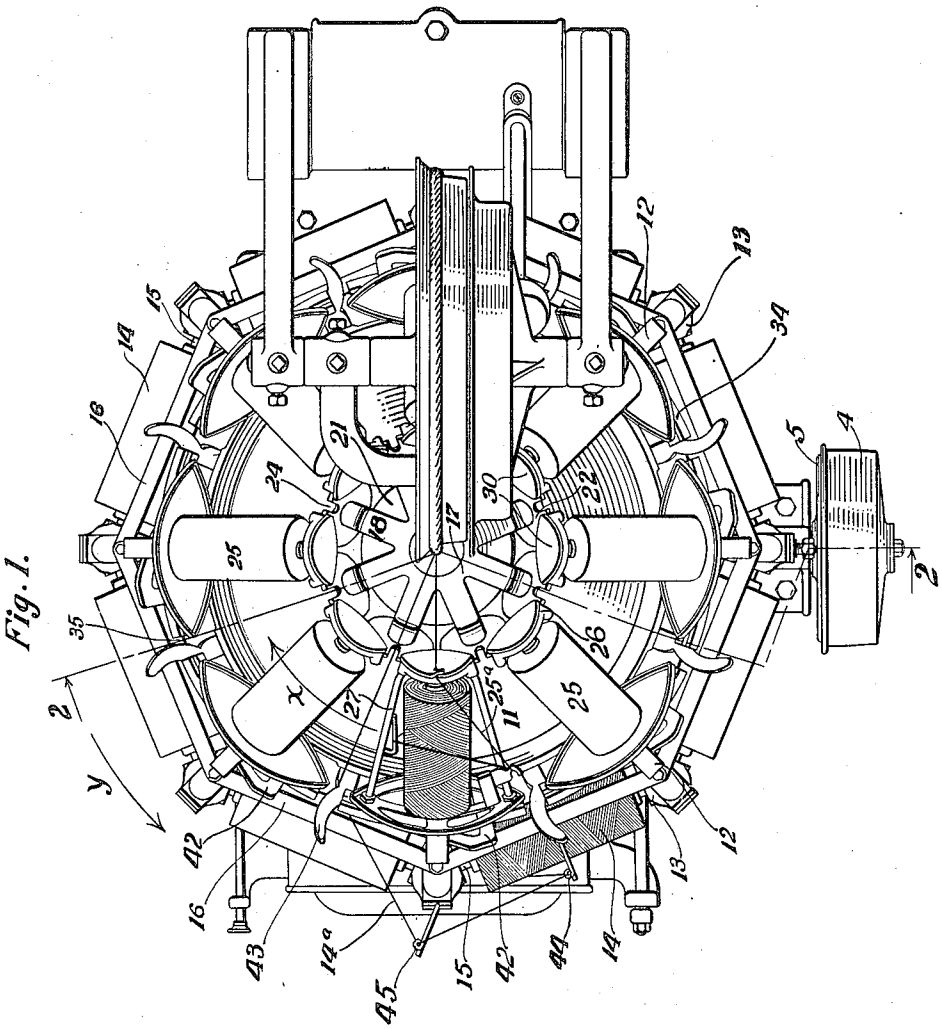

Fig. 1.

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BY
ATTORNEYS

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Fig. 5.

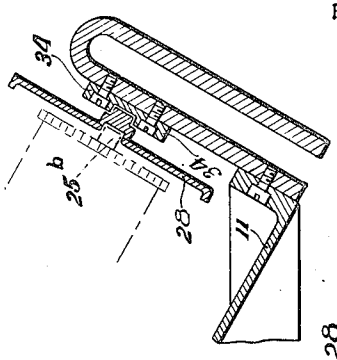

Fig. 2.

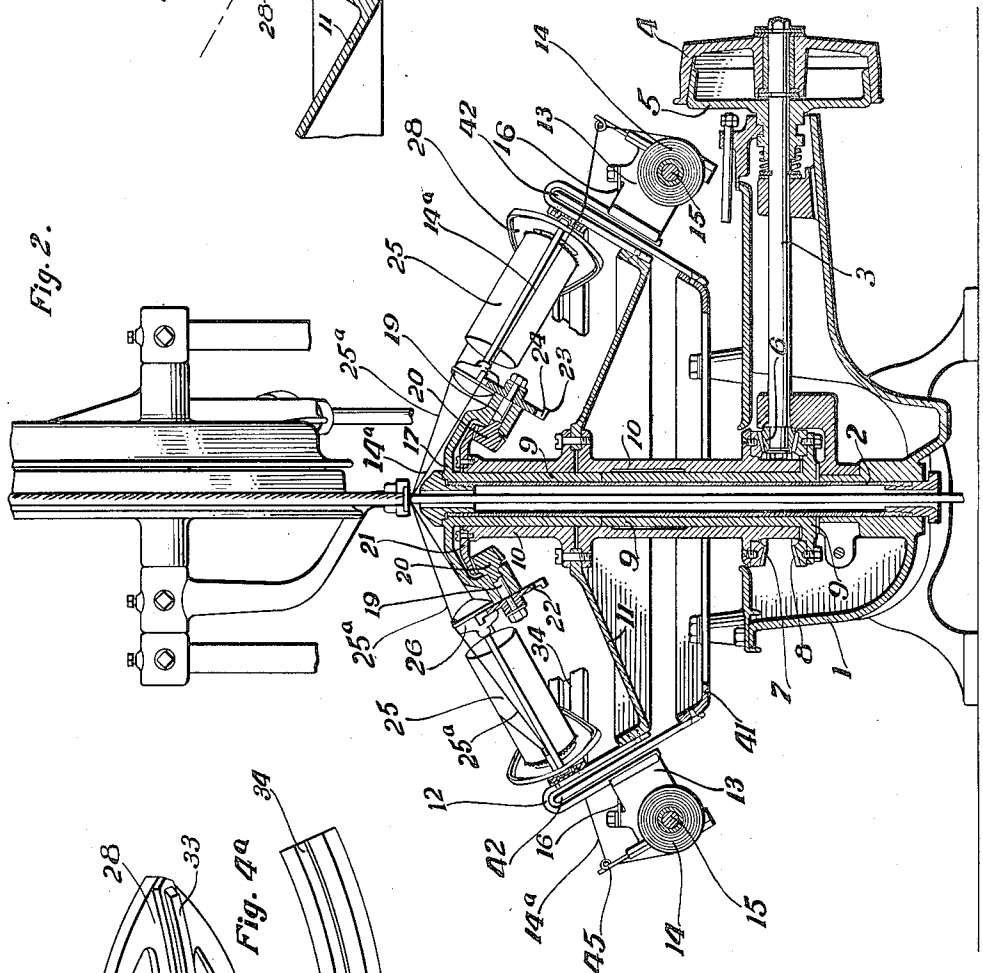

Fig. 4.

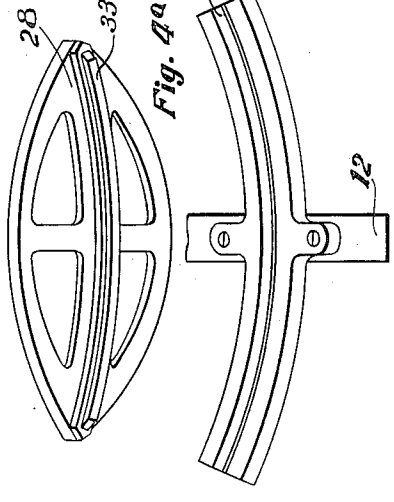

Fig. 4a

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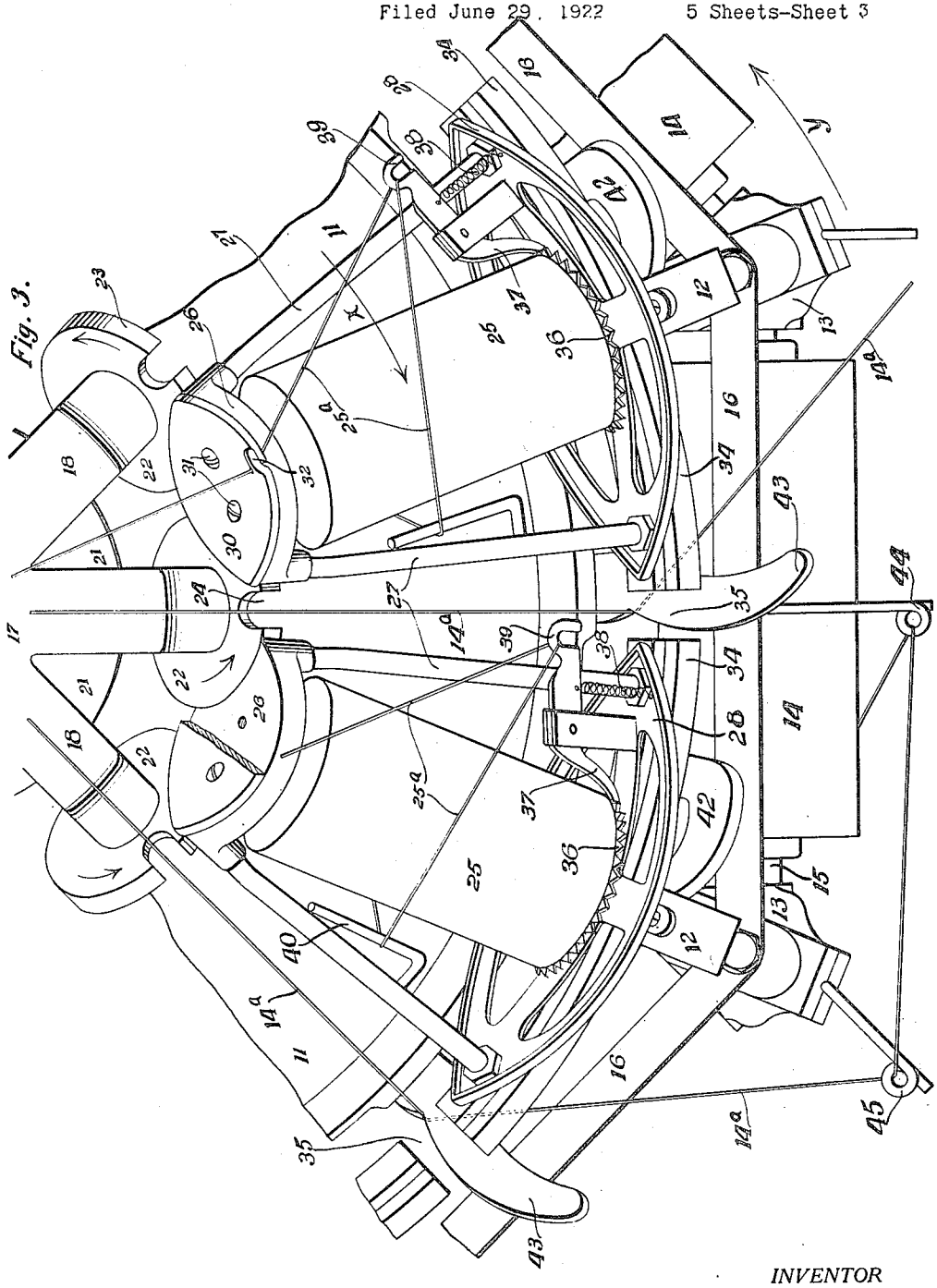
Fig. 3.



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F. KLEIN

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Fig. 6.

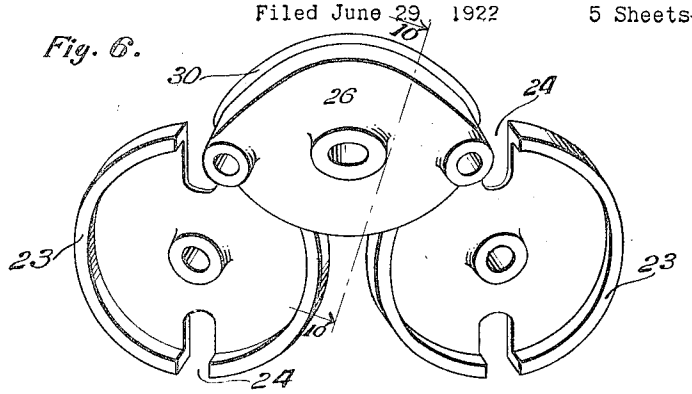


Fig. 7.

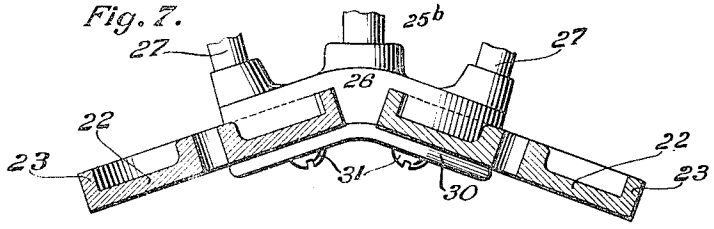


Fig. 8.

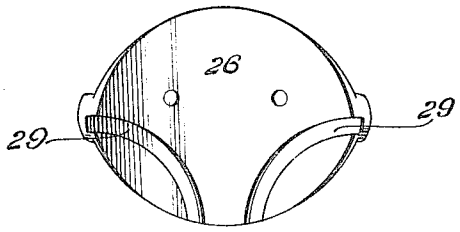


Fig. 9.

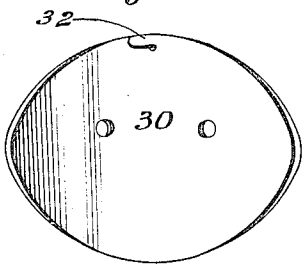


Fig. 10.

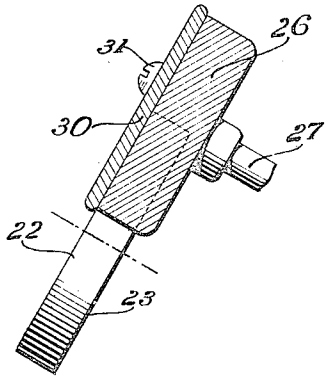
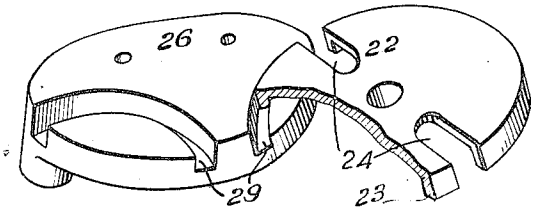


Fig. 11.



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May 13, 1924. 1,493,782

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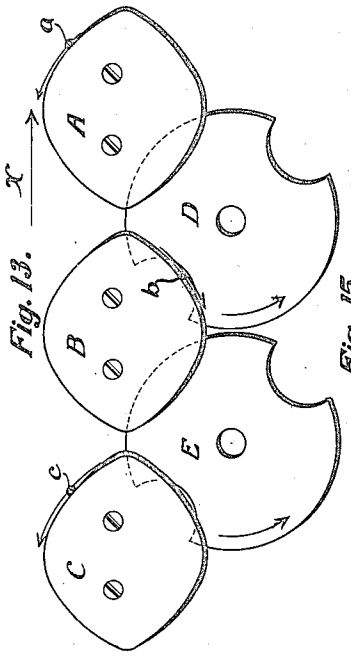
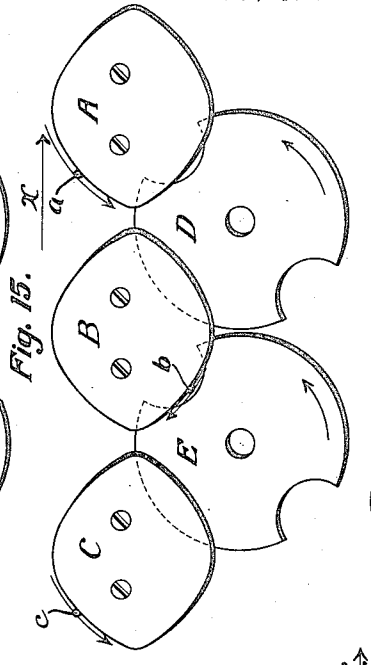
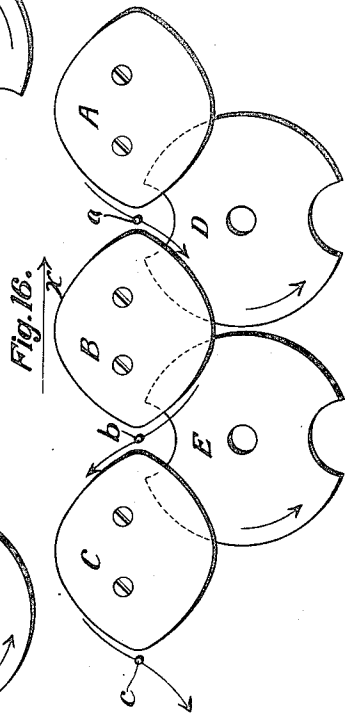
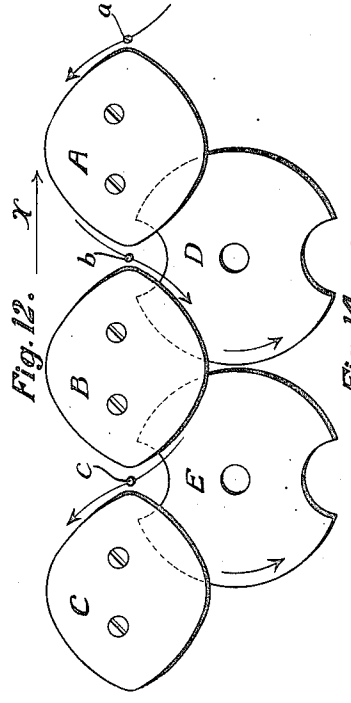
BRAIDING MACHINE

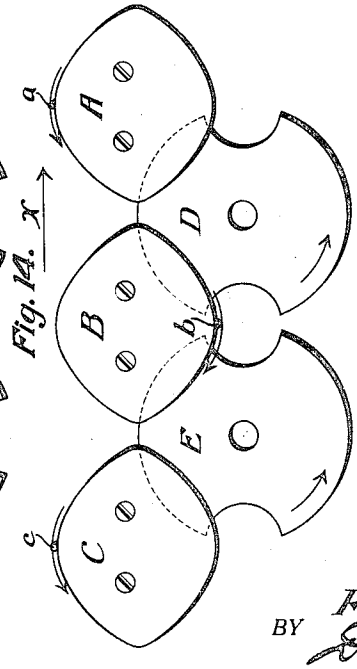
Filed June 29, 1922 5 Sheets-Sheet 5











INVENTOR
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BY Davis Davis
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Patented May 13, 1924. 1,493,782

UNITED STATES PATENT OFFICE.

FREDERICK KLEIN, OF COLLEGE POINT, NEW YORK, ASSIGNOR TO NATIONAL INDICATOR COMPANY, OF LONG ISLAND CITY, NEW YORK, A CORPORATION OF NEW YORK.

BRAIDING MACHINE.

Application filed June 29, 1922. Serial No. 571,621.

To all whom it may concern:

Be it known that I, FREDERICK KLEIN, a citizen of the United States, and resident of College Point, in the borough and county of Queens, city and State of New York, have invented certain new and useful Improvements in Braiding Machines, of which the following is a specification.

This invention relates to that type of machine in which two oppositely rotating tables or turrets are provided, each turret or table carrying a series of spools or bobbins, the threads from all of said spools converging at a braiding point above the machine and means being provided whereby the threads from one series of bobbins will be interlaced with the threads from the other series of bobbins. The purpose of machines of this type is to produce a tubular braided fabric with or without a core. Such machines are largely for braiding coverings on electric wires; but of course it will be understood that they are capable of a great variety of uses.

One of the main objects of this invention is to suspend the inner series of bobbins at their upper ends on a rotatable turret in such a manner that the bobbins and the turret will rotate together and the use of an annular shuttle track will be avoided. This construction reduces the friction incident to the relative movement of the shuttles or bobbin carriers on the track.

Another important object of the invention is to provide a series of rotatable disks for supporting the carriers of the inner series and to provide said rotatable disks with means to permit the threads from the outer series of bobbins to pass under the bobbins of the inner series. The bobbin supporting disks constitute the inner turret or supporting member and revolve around the vertical axis of the machine and carry with them the inner series of bobbins. Each supporting disk is rotated around its own axis for the purpose of allowing the threads from the outer series of bobbins to pass under the inner series of bobbins as the said inner series revolves around the machine.

Another object of the invention is to provide means for guiding the outer ends of the inner series of bobbins. The purpose of this guiding means is to prevent any tendency of the shuttles or carriers to bind on the rotatable supporting disks. This machine is designed for operation at a very high speed, and the outer ends of the inner series of bobbins tend to lift due to centrifugal force, and the guiding means is designed to hold the bobbins in a substantially neutral position and thereby to prevent the shuttles or carriers binding on the rotatable supporting disks.

There are other important objects and advantages of the invention which will appear hereinafter.

In the drawings, Fig. 1 is a plan view of the machine;

Fig. 2 a vertical sectional view thereof taken substantially on the line 2—2 of Fig. 1;

Fig. 3 an enlarged plan view of a portion of the machine;

Fig. 4 a detail perspective view of the outer end of one of the inner series of bobbin carriers;

Fig. 4ª a detail view of a portion of the track for guiding outer ends of the inner series of carriers;

Fig. 5 a detail sectional view of the bobbin guide and track;

Fig. 6 a detail perspective view of two bobbin supporting disks with a bobbin carrier head engaged therewith;

Fig. 7 a bottom plan view of a bobbin carrier head showing the two engaged supporting disks in sectional view;

Fig. 8 a detail view of the upper surface of the carrier head;

Fig. 9 a similar view of the carrier head cover plate;

Fig. 10 a vertical sectional view of the carrier head taken on the line 10—10 of Fig. 6;

Fig. 11 a detail perspective view of the carrier head and one engaged supporting disk, the cover plate being removed from the carrier head;

Figs. 12 to 16 inclusive, diagrammatic views of a series of carrier heads and their supporting disks showing the relative positions of notches of the disks and heads during the travel of the threads from the outer series of bobbins over and under the inner series of bobbins.

Referring to the various parts by numerals 1 designates the base of the machine in

which is rigidly mounted an upwardly extending rigid tubular post 2. In the base 1 is suitably mounted a horizontal drive shaft 3 carrying a pulley 4 at its outer end adapted to be engaged by a suitable clutch 5 to connect said driving pulley to the drive shaft, in the usual or any suitable manner. A beveled driving pinion 6 is mounted on the inner end of the drive shaft, said pinion 6 engaging two beveled gears 7 and 8 and by means of which the bobbin carrying turrets are rotated in opposite directions, as will be fully hereinafter described.

Rotatably mounted upon the post 2 is an inner driving sleeve 9 to the lower end of which a beveled gear 8 is rigidly secured. Mounted on the sleeve 9 is an outer drive sleeve 10 which carries near its lower end the beveled gear 7. It is manifest from this construction that the driving sleeves 9 and 10 will be rotated in opposite directions, the drive pinion 6 being arranged between said beveled gears. The driving pinion 6 and the beveled gears 7 and 8 are preferably located within the base of the machine for safety and for convenience of oiling.

Rigidly secured to the outer driving sleeve, at a suitable point above the base, is an outwardly and downwardly flaring circular turret plate 11. To the outer margin of this turret plate is secured a series of upwardly extending arched bobbin supports 12, the lower ends of the two arms of these supports being substantially co-incident with the lower margin of the circular turret plate 11. As shown in Fig. 1 there are eight of these supports 12 spaced equal distances apart around the turret. To the lower ends of the outer members of these arched supporting plates are secured carriers 13 which support the outer bobbins or thread carriers 14. These outer bobbins are supported on horizontal spindles 15 mounted in suitable bearings in the carriers 13. The carriers 13 are connected together around the machine by brace bars 16.

The inner driving sleeve 9 carries on its upper end a spider frame 17 formed with eight radial arms 18 which extend outwardly and downwardly, as shown clearly in Figs. 1, 2 and 3 of the drawings. The lower outer end of each of these spider arms is tubular and forms a bearing for a short radially arranged shaft 19, said shaft extending outwardly and downwardly. To the upper end of each of said shafts 19 is secured a beveled pinion 20. Rigidly secured to the upper end of the outer driving sleeve, just under the spider 17, is a crown gear 21 which meshes with all of the pinions 20. Rigidly secured to the outer lower end of each shaft 19 is a carrier supporting disk 22, each of said supporting disks being formed around its margin with an outwardly turned annular flange 23. Each of said supporting disks is formed at diametrically opposite points with two thread receiving and carrying notches 24.

The bobbins 25 of the inner series are each mounted in a carrier frame consisting of an upper carrier head 26; two outwardly and downwardly diverging side bars 27 connected to said head, and a large outer shuttle plate 28 rigidly connected to the lower ends of the side bars 27. The bobbin spindles 25^b are mounted in suitable bearings formed centrally of the carrier head and in the shuttle plate, as shown clearly in Figs. 5, 7 and 10 of the drawings. Each shuttle plate 28 is substantially elliptical in form with its longer axis horizontal and its end pointed. The side bars 27 are connected to the shuttle plate 28 near the ends of said plate. The carrier heads 26 are also substantially elliptical in form with their longer axis substantially horizontal and the side bars 27 are connected to said heads near their ends.

Each carrier head 26 is arranged between two adjoining supporting disks 22 and is adapted to be engaged with and supported by said disks. Each carrier head is formed on its upper surface with two curved channels or grooves 29 which are adapted to receive the flanges 23 of the engaged supporting disks. The carrier head is also cut out on its upper surface to receive the supporting disks so that the upper surfaces of the carrier and the supporting disks will be substantially flush with each other. The two supporting disks are at an angle to each other and the carrier head is dished slightly to bring its engaged portions into parallel relation with the supporting disks, as clearly shown in Fig. 7. To lock each carrier head to its engaged supporting disks, a cover plate 30 is provided, said plate being secured to the carrier plate by means of screws 31. The cover plate is of the same outline as the carrier head but is slightly larger in order to form an efficient thread guide and to serve in the manner of a shuttle, as will be more fully hereinafter described. On the outer margin of each cover plate is formed a thread holding lip 32 with which the thread from the inner bobbin engages. The shafts 19 of the supporting disks are so arranged that the supporting disks are in planes inclined inwardly and downwardly toward the axis of the driving sleeves. The carrier heads are supported by said disks in such a position that the axes of the bobbins of the inner series incline outwardly and downwardly from the carrier heads. The inner series of bobbins are preferably suspended from their upper end at an angle which they would assume under the influence of the centrifugal force due to the speed of the rotating turret.

Each shuttle plate 28 is provided on its

outer or lower side with a horizontally extending guide shoe 33 which extends substantially throughout the length of the shuttle plate and is adapted to engage and slide freely in a grooved guide track 34. This guide track is sectional, with open place 35 at the ends of said sections; and each section is rigidly secured to the upper inner side of the arched supports 12. These supports 12 are carried by the outer turret plate 11 so that the guide track sections will rotate with the outer turret. The guide shoes 33 hold the carrier heads 26 in their proper angular relation with their engaged supporting disks and prevent any binding which otherwise might possibly result from the high speed of rotation of the inner turret. It is manifest that there might be a tendency for the outer ends of the suspended bobbins to rise and thereby cause a binding of the carrier heads on the supporting heads, when the inner turret is rotating at high speed. The shoes are of sufficient length to bridge the spaces between the sections of the guide track.

Each bobbin 25 of the inner series is provided at its outer end with a ratchet wheel 36; and pivoted on each shuttle plate 28 is a locking pawl 37 which is held yieldingly in engagement with the ratchet wheel by light spring 38. The locking pawl is formed with an outwardly extending thread engaging arm 39. The thread from the bobbin passes around a rigid guide pin 40 mounted on one of the side bars 27 and then around the thread engaging arm 39 and thence to the thread guiding lip 32 of the cover plate. From the lip 32 the thread passes directly up to the braiding point, as shown clearly in Figs. 1 and 2. The locking pawl 37 holds the bobbins against rotation. When, however, the tension on the thread is sufficient to swing the locking pawl out of engagement with the ratchet wheel, the bobbin will turn and release a supply of thread. The tension springs 38 will then swing the locking pawl back into engagement with the ratchet wheel. In this way a too free rotation of the bobbin 25 is prevented.

Rigidly mounted on the base of the machine is a ring 41. Secured to this ring is a series of upwardly extending stationary thread guides 42. These thread guides are so arranged that they extend up into the arched supports, 12, as clearly shown in Fig. 2, the upper ends of said guides rising to a point slightly above the horizontal center line of the shuttle plates 28. The thread guides are inclined on their outer surfaces and serve to engage the threads from the outer series of bobbins and lift them above the points of the shuttle plates 28 in order to insure said threads passing over said plates and consequently over the outer series of bobbins. They are located in the desired positions around the supporting ring 41 in order to secure the desired over and under arrangement of the braiding threads. These stationary thread guides are clearly shown and described in my Patent 1,465,554, granted Aug. 21, 1923.

Secured to the lower margin of the turret plate 11 is a series of outwardly and upwardly extending thread guides 43. These thread guides 43 are located between the arched supports 12 and coincident with the open spaces 35 between the guide track sections 34. Each guide 43 is provided with a notch or depression to receive the thread 14^a from the outer bobbin 14. These notches are slightly below the pointed ends of the shuttle plates 28 to insure the threads 14^a passing below said shuttles and under the inner series of bobbins. From the notch in the thread guide 43 the said guide is curved outwardly in order to provide a smooth surface over which the thread will ride when it is lifted or carried outwardly by the stationary thread guides 42. The spaces 35 are provided in the guide track to permit the stationary thread guides 42 to carry the threads 14^a outwardly beyond said track and over the shuttle plates 28. The threads from the outer bobbins pass through suitable thread guides and tension devices 44 and 45; and from the thread guides and tension devices 45 the threads pass directly to the notches in the thread guides 43.

In operation the inner turret carrying the inner series of bobbins rotates in the direction indicated by the arrow x in Fig. 1; and the lower turret carrying the outer series of bobbins rotates in the direction indicated by the arrow y. The supporting disks 23 are rotated through pinions 20 and crown gear 21. The carrier heads 26 are supported at all times by their engaged supporting disks. The notches 24 in the supporting disks are so placed and the rotation of said disks is so timed that when the threads 14^a from the outer series of bobbins rest in the notches of the thread guides 43 said threads will be received in the notches 24 of the supporting disks and carried under the carrier heads 26. At the same time the shuttle plates 28 are diverting the threads 14^a under said shuttle plates so that the threads 14^a will pass freely under the inner series of bobbins. When the threads 14^a are engaged by the stationary thread guides 42 said threads also will be engaged within the free notches 24 of the supporting disks and will therefore be free to be lifted out of said notches and over the bobbins of the inner series. The supporting disks are so timed in their rotation that one of the notches 24 will be free and open and between two adjoining carrier heads 26 whenever the threads 14^a are in engagement with either the guides 43 or the guides 42.

The movement of the threads 14ª around the carrier head 26 is illustrated diagrammatically in Figs. 12 to 16 inclusive. Three threads are shown and for convenience of reference they are lettered *a*, *b* and *c*. The supporting disks D and E rotate in the directions indicated by their arrow. The direction of movement of the supporting disks and their attached carriers around the machine is indicated by the arrow *x*. Referring to Fig. 12, the threads *a* and *c* are in position to be engaged by the stationary thread guides 42 and lifted away from the supporting disks and caused to travel up over the carrier heads A and C. The thread *b* is engaged in the notch of the thread guide 43, and the shuttle plate 28 of the carrier head B, moving in the direction of the arrow *x*, causes said thread *b* to pass under said shuttle plate and the head B. The disk D is rotating in the direction indicated by its arrow and the notch in said disk receives the thread *b* and permits it to pass under the head B. The rotation of the disk D is so timed that the thread *b* will pass under the head B practically without contact with the disk D. The purpose of notching the supporting disks and rotating them is to provide a free path for the threads from the outer set of bobbins to pass under the heads of the inner bobbins. The positions of the threads *a* and *c* traveling over the carrier heads and the thread *b* traveling under the carrier head are shown in Fig. 13. In Fig. 14 the threads have made one half of their movement around the carrier heads. The thread *b* has passed out of the notch of the carrier disk D and is about to enter the notch 24 of the adjoining carrier disk E. In Fig. 15 the threads are shown as completing their travel around the carrier heads. In Fig. 16 the movement of the threads around the carrier heads is complete. The thread *a* has completed its movement over the carrier head A and is in position to enter one of the notches in the supporting disk D. The thread *b* has completed its movement under the carrier head B and is in position to be picked up by one of the stationary thread guides 42 and caused to travel over the carrier head C. This over and under movement of the threads from the outer bobbins is continuous around the entire series of inner carriers and their supporting disks. When the threads 14ª are in positions illustrated in Figs. 1, 3 and 12 they extend in a straight line from the notches of the thread guides 43 directly to the braiding point. They lie slightly within the notches 24 of the supporting disks and directly between the ends of adjoining carrier heads 26. In this position they are easily diverted under the carrier heads 26 through the movement of the shuttle plates 28, and over the shuttle plates and the carrier heads of the inner series of bobbins by the stationary thread guides 42.

It is manifest from the foregoing that there are no reciprocating parts in the machine. There is no track on which the carrier of the inner series of bobbins operate. A small part only of the supporting disks are in engagement with the carrier heads so that the friction between these engaging parts will be slight. It is manifest therefore that a machine constructed in accordance with this invention may be operated at very high speeds without noise and without undue wear on the parts and with little or no strain on the braiding threads.

When the machine is used for braiding a cover over a core, the core passes upwardly through the tubular post 2 and the braiding structure is wound over the take up wheel mounted above the machine, as illustrated in Fig. 2. The braiding threads are united at the braiding point just above the spider 17 and the spider arms are so shaped that they will not, in any way, interfere with the movement of the threads during the braiding operation.

The supporting disks and the bobbins of the inner series may be arranged at any desired or desirable angle with respect to the braiding point; and the bobbins of the outer series may be supported and rotated in any suitable manner.

What I claim is:—

1. A braiding machine comprising a base, an outer series of thread bobbins, means for moving said bobbins in one direction around the machine, an inner series of thread bobbins, carriers for said inner bobbins, a series of supporting disks mounted independently of the carriers and engaging and supporting said carriers, means for rotating said disks, means for moving the disks and the engaged carriers around the machine opposite the direction of movement of the outer series of bobbins, and means cooperating with the said disks for causing the threads from the outer series of bobbins to pass over and under the threads from the inner series of bobbins.

2. A braiding machine comprising a base, a central vertical support, an inner driving sleeve mounted on said support, an outer driving sleeve rotatable on the inner sleeve, means for driving said sleeves in opposite directions, an outer series of thread bobbins carried by the outer driving sleeve, a series of supporting disks carried by the inner driving sleeve at the upper end thereof, means for rotating said supporting disks through the rotation of the outer driving sleeve, a series of thread bobbins suspended from said supporting disks, the said disks being mounted independently of said bob-

bins and means cooperating with the said disks for causing the threads from the outer series of bobbins to pass over and under the threads from the bobbins suspended from the supporting disks.

3. A braiding machine comprising a base, a central vertical support, an inner driving sleeve mounted on said support, an outer driving sleeve rotatable on the inner sleeve, means for driving said sleeves in opposite directions, an outer series of thread bobbins carried by the outer driving sleeve, a series of radially arranged downwardly and outwardly inclined arms connected to the upper end of the inner driving sleeve, a radially arranged downwardly and outwardly inclined shaft mounted in each of said arms, a pinion secured to the upper inner end of each of said shafts, a gear carried by the upper end of the outer driving sleeve and meshing with all of said pinions, a supporting disk connected to the outer end of each of said radially arranged shafts, a series of outwardly and downwardly extending bobbin carriers suspended from said supporting disks, the said disks being mounted independently of the carriers, a thread bobbin mounted in each of said carriers, and means cooperating with the said disks for causing the threads from the outer series of bobbins to pass over and under the threads from the bobbins suspended from the supporting disks.

4. A braiding machine comprising a base, a central vertical support, an inner driving sleeve mounted on said support, an outer driving sleeve rotatable on the inner sleeve, means for driving said sleeves in opposite directions, an outer series of thread bobbins carried by the outer driving sleeve, a series of radially arranged downwardly and outwardly inclined arms connected to the upper end of the inner driving sleeve, a radially arranged downwardly and outwardly inclined shaft mounted in each of said arms, a pinion secured to the upper inner end of each of said shafts, means for driving said pinions, a supporting disk connected to the outer end of each of said radially arranged shafts, a series of outwardly and downwardly extending bobbin carriers suspended from said supporting disks, the said disks being mounted independently of the carriers, a thread bobbin mounted in each of said carriers, and means cooperating with the said disks for causing the threads from the outer series of bobbins to pass over and under the threads from the bobbins suspended from the supporting disks.

5. A braiding machine comprising a base, a central vertical support, an inner driving sleeve mounted on said support, an outer driving sleeve rotatable on the inner sleeve, means for driving said sleeves in opposite directions, an outer series of thread bobbins carried by the outer driving sleeve, a series of radially arranged downwardly and outwardly inclined arms connected to the upper end of the inner driving sleeve, a radially arranged downwardly and outwardly inclined shaft mounted in each of said arms, a pinion secured to the upper inner end of each of said shafts, means for driving said pinions, a notched supporting disk connected to the outer end of each of said radially arranged shafts, a series of outwardly and downwardly extending bobbin carriers suspended from said supporting disks and spaced equal distances apart around the machine, each of said carriers being engaged by and suspended from two adjoining disks and each supporting disk engaging two adjoining carriers, a thread bobbin mounted in each of said carriers, and means cooperating with the notched supporting disks for causing the threads from the outer series of bobbins to pass over and under the threads from the bobbins suspended from the supporting disks.

6. A braiding machine comprising a base, a central vertical support, an inner driving sleeve mounted on said support, an outer driving sleeve rotatable on the inner sleeve, means for driving said sleeves in opposite directions, an outer series of thread bobbins carried by the outer driving sleeve, a series of radially arranged downwardly and outwardly inclined arms connected to the upper end of the inner driving sleeve, a radially arranged downwardly and outwardly inclined shaft mounted in each of said arms, a pinion secured to the upper inner end of each of said shafts, means for driving said pinions, a notched supporting disk connected to the outer end of each of said radially arranged shafts, a series of outwardly and downwardly extending bobbin carriers suspended from said supporting disks and spaced equal distances apart around the machine, each of said carriers being engaged by and suspended from two adjoining disks and each supporting disk engaging two adjoining carriers, a thread bobbin mounted in each of said carriers, a shuttle plate forming the outer end of each of said carriers, and means for causing the threads from the outer series of bobbins to pass over and under the said shuttle plates.

7. A braiding machine comprising a base, a central vertical support, an inner driving sleeve mounted on said support, an outer driving sleeve rotatable on the inner sleeve, means for driving said sleeves in opposite directions, an outer series of thread bobbins carried by the outer driving sleeve, a series of radially arranged downwardly and outwardly inclined arms connected to the upper end of the inner driving sleeve, a radially arranged downwardly and outwardly inclined shaft mounted in each of

said arms, a pinion secured to the upper inner end of each of said shafts, means for driving said pinions, a supporting disk connected to the outer end of each of said radially arranged shafts each of said disks being notched at two diametrically opposite points, a series of carrier heads spaced equal distances apart around the machine, means for locking each of said heads to two adjoining supporting disks and each of said supporting disks being locked to two adjoining carrier heads, a downwardly and outwardly extending thread bobbin carried by each of said carrier heads, and means co-operating with the notches in the supporting disks for causing the threads from the outer bobbins to pass over and under the carrier heads.

8. A braiding machine comprising a base, an outer series of thread bobbins, means for moving said bobbins in one direction around the machine, an inner series of thread carriers spaced equal distances apart around the machine, a thread bobbin mounted in each of said carriers, a series of supporting disks spaced equal distances around the machine each of said disks being formed with two marginal notches at diametrically opposite points, each of said carriers being engaged by and suspended from two adjoining supporting disks and each supporting disk engaging two adjoining carriers, means for rotating the supporting disks, means for moving the disks and the engaged carriers around the machine opposite the direction of movement of the outer series of bobbins, and means co-operating with the notches in the supporting disks for causing the threads from the outer series of bobbins to pass over and under the threads from the bobbins suspended from the supporting disks.

9. A braiding machine comprising a base, an outer series of thread bobbins, means for moving said bobbins in one direction around the machine, a rotatable frame above the outer series of bobbins, means for rotating said frame around the machine opposite the direction of movement of the lower series of carriers, radially arranged downwardly and outwardly inclined shafts mounted in said frame, a pinion secured to the upper inner end of each of said shafts, means for driving said pinions, a supporting disk connected to the outer end of each of said radially arranged shafts, a series of outwardly and downwardly extending bobbin carriers suspended from said supporting disks and spaced equal distances apart around the machine each of said carriers being engaged by and suspended from two adjoining disks and each supporting disk engaging two adjoining carriers, a thread bobbin mounted in each of said carriers, and means for causing the threads from the outer series of bobbins to pass over and under the threads from the bobbins suspended from the supporting disks.

10. A braiding machine comprising a base, a central vertical support, an inner driving sleeve mounted on said support, an outer driving sleeve rotatable on the inner sleeve, means for driving said sleeves in opposite directions, an outer series of thread bobbins carried by the outer driving sleeve, a series of radially arranged downwardly and outwardly inclined arms connected to the upper end of the inner driving sleeve, a radially arranged downwardly and outwardly inclined shaft mounted in each of said arms, a pinion secured to the upper inner end of each of said shafts, means for driving said pinions, a notched supporting disk connected to the outer end of each of said radially arranged shafts, a series of outwardly and downwardly extending bobbin carriers suspended from said supporting disks and spaced equal distances apart around the machine, each of said carriers being engaged by and suspended from two adjoining carriers, a thread bobbin mounted in each of said carriers, a shuttle plate forming the outer end of each of said carriers, a guide shoe carried by said shuttle plate, a guide track carried by the outer driving sleeve and moving with the outer series of bobbins and adapted to be engaged by said guide shoe, and means for causing the threads from the outer series of bobbins to pass over and under the said shuttle plates.

11. A braiding machine comprising a base, an outer series of thread bobbins, means for moving said bobbins in one direction around the machine, an inner series of thread carriers spaced equal distances apart around the machine, a thread bobbin mounted in each of said carriers, a series of supporting disks spaced equal distances around the machine each of said disks being formed with two marginal notches at diametrically opposite points, each of said carriers being engaged by and suspended from two adjoining supporting disks and each supporting disk engaging two adjoining carriers, means for rotating the supporting disks, means for moving the disks and the engaged carriers around the machine opposite the direction of movement of the outer series of bobbins, a shuttle plate forming the outer end of each of said carriers, a guide shoe on the outer lower surface of said shuttle plate, a guide track moving with the outer series of bobbins and adapted to be engaged by said guide shoe, and means co-operating with the notches in the supporting disks for causing the threads from the outer series of bobbins to pass over and under the threads from the bobbins suspended from the supporting disks.

12. A braiding machine comprising a base, an outer series of thread bobbins,

means for moving said bobbins in one direction around the machine, an inner series of thread bobbins, carriers for said inner bobbins, a series of supporting disks engaging and supporting said carriers, means for rotating said disks, means for moving the disks and the engaged carriers around the machine opposite the direction of movement of the outer series of bobbins, a shuttle plate forming the outer end of each of said carriers, a guiding means carried by each of said shuttle plates, a guide track rotating with the outer series of thread bobbins and adapted to be engaged by the guiding means on the shuttle plates, and means for causing the threads from the outer series of bobbins to pass over and under the threads from the inner series of bobbins.

13. A braiding machine comprising a base, an outer series of thread bobbins, means for moving said bobbins in one direction around the machine, an inner series of thread bobbins, carriers for said inner bobbins, a series of supporting disks engaging and supporting said carriers, means for rotating said disks, means for moving the disks and the engaged carriers around the machine opposite the direction of movement of the outer series of bobbins, a shuttle plate forming the outer end of each of said carriers, a guiding means carried by each of said shuttle plates, a sectional guide track rotating with the outer series of thread bobbins and adapted to be engaged by the guiding means on the shuttle plates, and means for causing the threads from the outer series of bobbins to pass over and under the threads from the inner series of bobbins.

14. A braiding machine comprising an inner turret, an outer turret, a series of bobbin carriers connected at their upper ends to the inner turret and moving around the machine therewith, said bobbin carriers inclining outwardly and downwardly from their points of support, means carried by the outer turret adapted to be engaged by the outer ends of said bobbin carriers of the inner turret to guide said carriers and limit the up-and-down swinging movements of the outer ends thereof, a thread bobbin mounted in each of said carriers, a series of thread bobbins carried by the outer turret, means for causing the threads from the outer series of bobbins to pass over and under the threads from the bobbins carried by the inner turret, and means for rotating the inner turret and outer turret in opposite directions.

15. A braiding machine comprising an inner turret, an outer turret, a series of bobbin carriers connected at their upper ends to the inner turret and moving around the machine therewith, said bobbin carriers inclining outwardly and downwardly from their points of support, a sectional guide track carried by the outer turret, means on each of the said carriers of the inner turret to engage said guide track to limit the up-and-down swinging movements of the outer ends of the carriers, a thread bobbin mounted in each of said carriers, a series of thread bobbins carried by the outer turret, means for causing the threads from the outer series of bobbins to pass over and under the threads from the bobbins carried by the inner turret, and means for rotating the inner turret and outer turret in opposite directions.

In testimony whereof I hereunto affix my signature.

FREDERICK KLEIN.