S. W. WARDWELL.

BRAIDING MACHINE.

APPLICATION FILED MAY 3, 1909.

1,032,870.

Patented July 16, 1912.

5 SHEETS—SHEET 1.

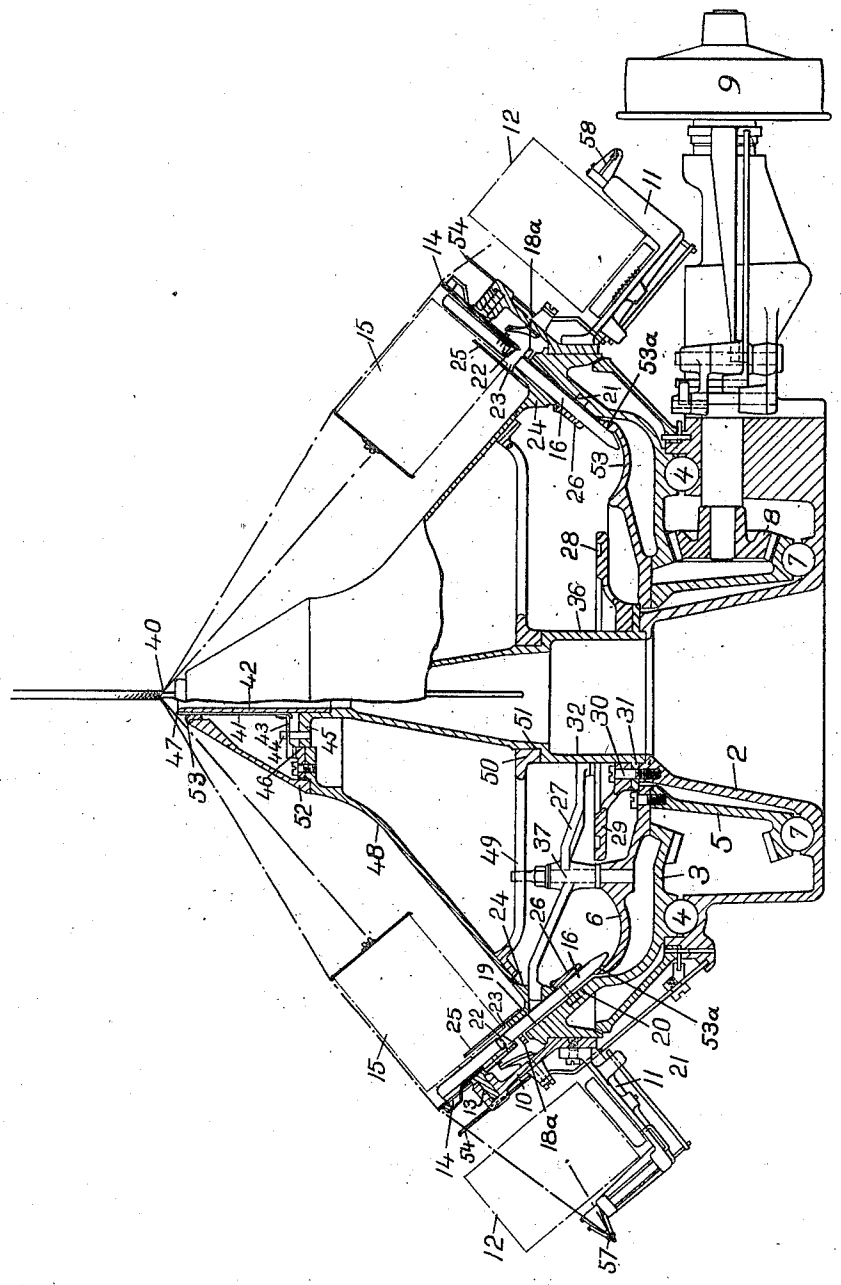

FIG. 1.

WITNESSES:

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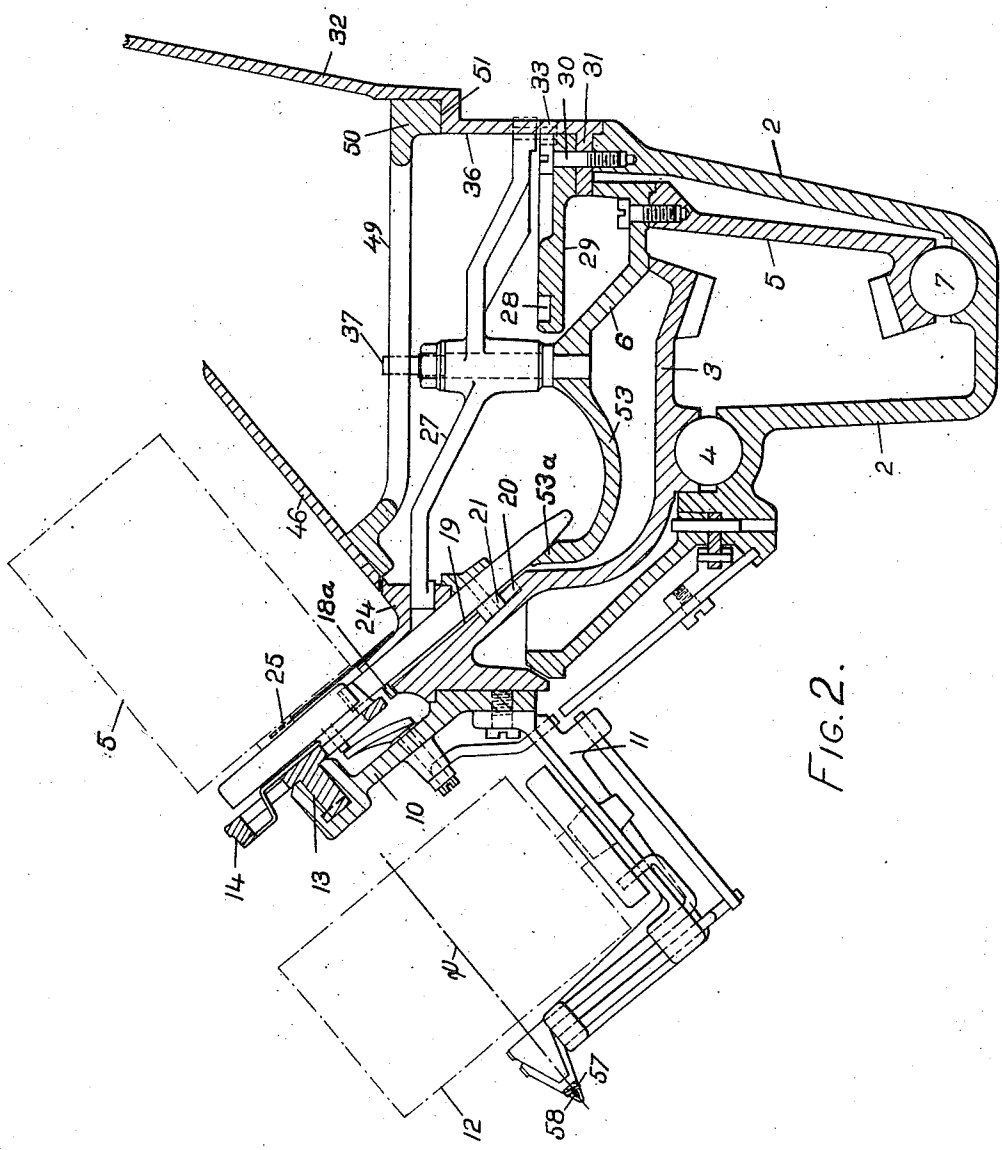

FIG. 2.

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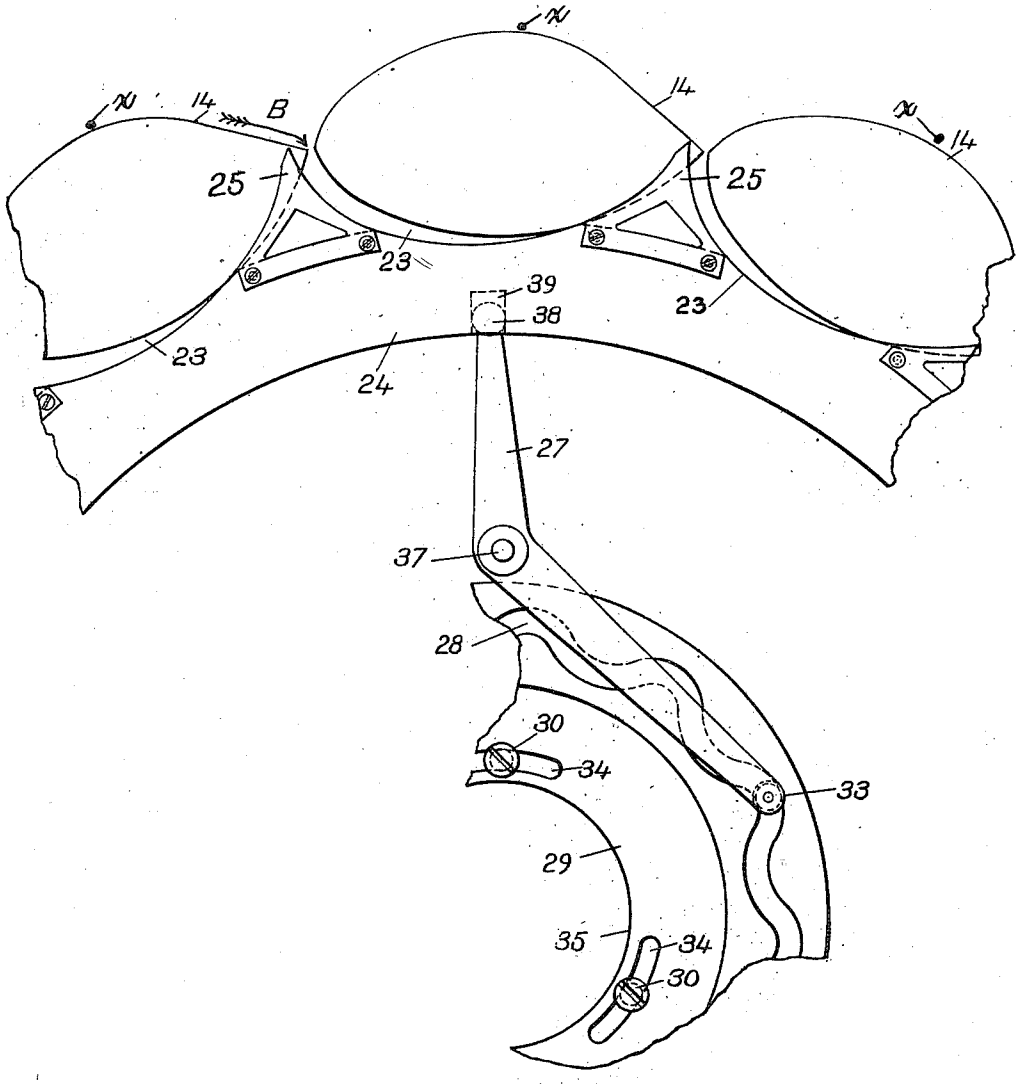

FIG. 3.

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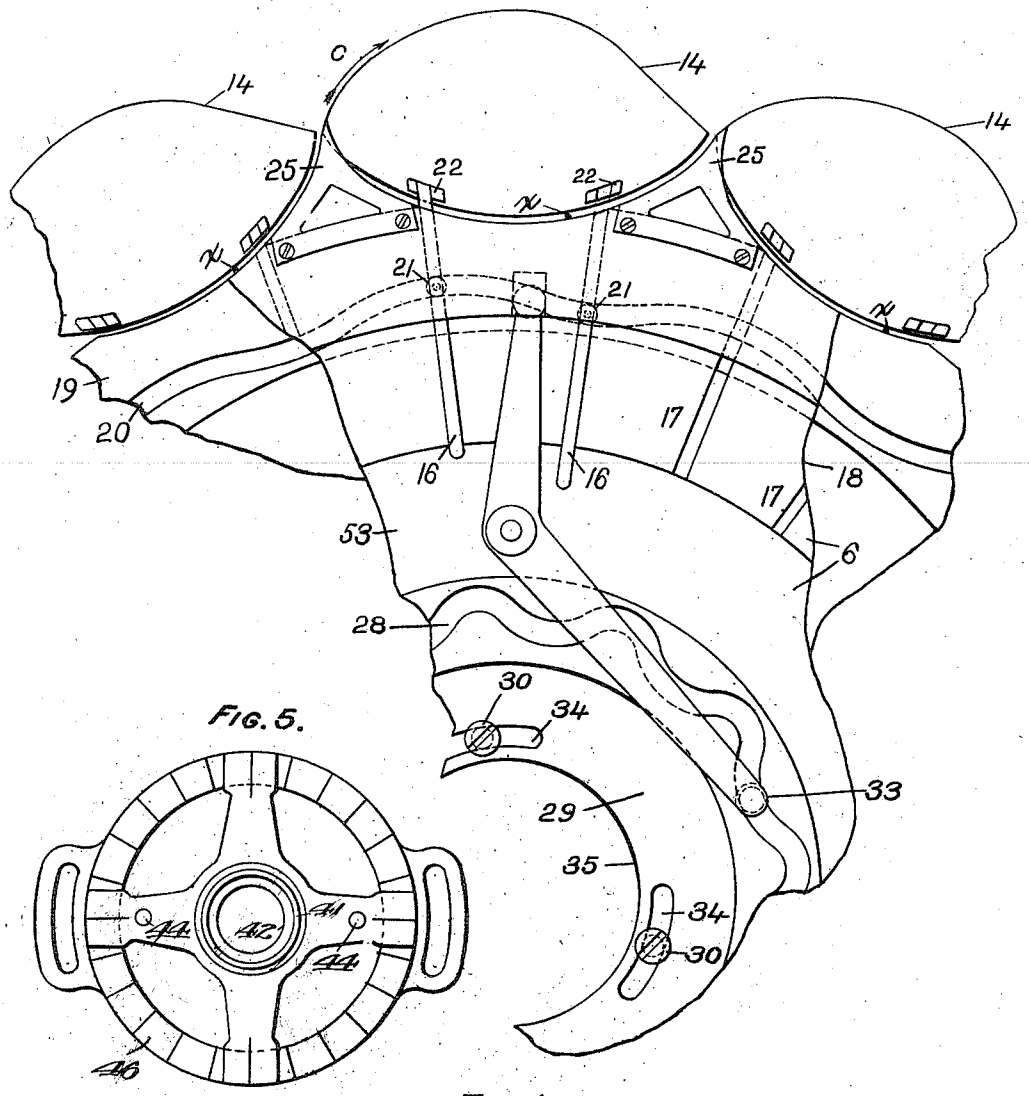

FIG. 4.

FIG. 5.

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5 SHEETS—SHEET 5.

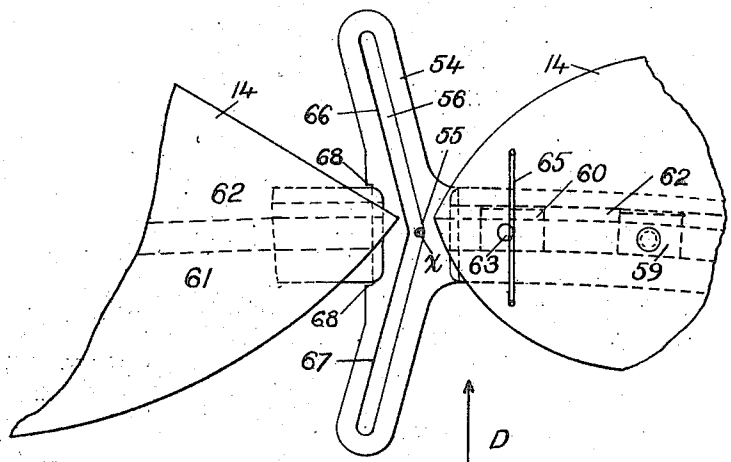


FIG. 6.

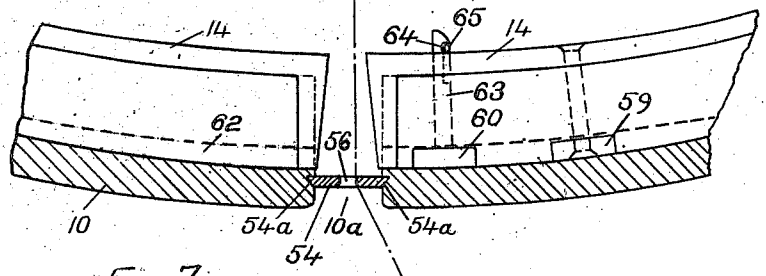
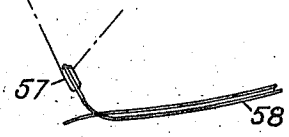


FIG. 7.



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SIMON W. WARDWELL, OF PROVIDENCE, RHODE ISLAND.

BRAIDING-MACHINE.

1,032,870. Specification of Letters Patent. Patented July 16, 1912.

Application filed May 3, 1909. Serial No. 493,716.

To all whom it may concern:

Be it known that I, SIMON W. WARDWELL, a citizen of the United States, residing at Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Braiding-Machines, of which the following is a specification.

My invention is an improved braiding machine and comprises means for augmenting the braiding capacity, enhancing the quality of the braid, facilitating operation of and imparting durability to the machine, all of which are accomplished in the peculiar manner set forth in the accompanying specification and illustrated in the accompanying drawings, which show respectively: Figure 1, a sectional elevation of my improved machine; Fig. 2, an enlarged portion of Fig. 1 showing more clearly the relations of the parts; Fig. 3 is a view showing the mode of operating the switches and the latter open to admit the sinuating yarns below the carriers; Fig. 4 is similar to Fig. 3, but shows the switches closed, to direct the sinuating yarns over the carriers, and also the arrangement of the drivers; Fig. 5 is a detail of the beater and beater cam; Fig. 6 is a detail of the angle plate; Fig. 7 is a view looking in the direction of the arrow D—Fig. 6, showing mode of mounting the angle plate and details of the foot pieces 59 and 60.

The machine of my invention comprises a frame 2, an outer turret 3 rotatable in one direction on the ball bearing 4 on the frame, and an inner turret 5, having a head 6, rotatable in a direction opposite to that of the outer turret on the ball bearing 7 on the frame. A gear 8 engaging both the inner turret and the outer turret, and driven by the pulley 9, serves to drive the two turrets in opposite directions as described. The devices for causing the pulley to operate or not operate the machine and for automatically arresting the pulley operation and the movement of parts propelled by the pulley are subject of another application and will not be described here.

To the outer turret is secured the ring 10 which carries the tension brackets 11 with their yarn supplies 12, and in which is a groove or race 13 in which travel the carriers 14 with their yarn supplies 15. Adjacent each tension bracket is a slot or threadway 10^a in the ring 10 to permit play of the lower yarn x as it sinuates over and under the carriers—Figs. 6 and 7.

The carriers 14 are propelled by the inner turret 5, through drivers 16 of which there are two to each carrier. They are disposed in conico-radial slots or guide ways 17 of the conical rim 18 of the inner turret head 6, see Fig. 4. These slots are cut entirely through the said rim, so the drivers ride directly over the conical inner surface 19 of the outer turret, but on the flange 18^a of the rim 18, and on the wall 53^a of the dished portion 53. The drivers are projected into and withdrawn from engagement with the carriers 14 by the cam groove 20 in the surface 19, through the rolls 21, of which there is one on each driver. On the deck of each carrier are two elevations 22 with each of which a driver engages. The arrangement of the drivers with respect to the cam groove 20 is such that each carrier is at all times engaged by one of its drivers and that each driver is withdrawn from the path of a passing yarn x so the latter may encounter no obstruction, in going beneath the carriers.

Braiding is effected by causing the sinuating yarn x to pass over some carriers and under others, through the space 23 between the carrier and the ring 24. On the ring 24 are switches 25—25, etc., spaced to correspond with the leading points of the carrier decks.

When the switch ring 24 with its switches 25 is in the position indicated by Fig. 3, each of the lower yarns x, traveling in the direction of the arrow B with respect to and over a carrier, will after passing that carrier go beneath and under the next through the passage 23. While the yarns x are so passing beneath the carrier, the switches are shifted into the position shown in Fig. 4, and the yarns x ride in the direction of the arrow C, up over the next succeeding carriers. The means and manner of so shifting the switches are as follows: The ring 24 is frusto-conical in external form, corresponding with the interior surface of the head 6 of the inner turret 5, and is maintained in its horizontal plane by the bearing brackets 26. Incidentally the ring 24 rests over and helps to retain the drivers 16 in the guideways 17. Primarily, it carries the switches 25—25—25— and moves them through their prescribed range of action, actuated through the lever 27 by the cam 29. The latter is secured to the frame 2 by screws

30—see Figs. 1, 2, 3 and 4, and rests on a flange 31 of the tubular central standard 32 which is secured with it. In the cam is a groove 28 which is more clearly shown in Figs. 3 and 4, with which the roll 33 in the lever 27 engages. The cam has arcal slots 34 through which the screws 30 pass, which slots permit adjustment of the cam to provide for a proper timing of the switches with reference to the movement of the carriers. The cam is maintained central in the machine by its bore 35 which fits the cylindrical surface 36 of the central tubular standard 32.

The lever 27 is carried on a stud 37 mounted on the inner turret, and engages the ring 24 by its extremity 38 which enters a corresponding recess 39. The ring 24 has therefore the same general rotative movement as the inner turret, with an independent oscillation caused by the cam 29 sufficient to properly operate the switches.

After the yarns have been properly interlaced, they draw together at the braiding point 40 where the braiding is compacted by a beater 41, so called. This is a sleeve vertically slidable on the tube 42 set in the top of the tubular standard 32 through both of which the core of the braid is drawn. At the bottom of the beater is a spider 43 which is prevented from turning by the pin 44 secured in the upper flange 45 of the central standard 32 and passing through an arm of the spider. The arms of the spider engage the rotatable cam 46 whereby the beater is caused to vibrate, its nose 47 playing against the yarns near the braiding point 40 and compacting the fabric.

The beater cam 46 is secured to the bonnet 48, which is supported on the spider 49, the hub 50 of which rides on the shoulder 51 of the central standard. Its top bore fits the top flange 45 of the central standard engaging the lower half thereof, the upper half being surrounded and engaged by the cam 46 itself. Thus the cam 46 is centered directly by the central standard, rather than by an intermediary thereby eliminating a source of inaccuracy of alinement.

The beater 41 and cam 46 are covered by a conical cap 52 which shields them from dirt and damage and, equally important, provides a polished bearing 53 over which the yarns draw to the braiding, preferably by a hardened bushing set into the cap. The bonnet 48 protects the interior of the machine from dirt and other foreign substances or articles. Protection from dirt is quite essential, because within the machine is an oil reservoir the contents of which must not be impaired in lubricating quality by the admixture of lint, fly and other extraneous matter.

It has been noted that the head 6 of the inner turret 5 is dished. This dished portion 53 constitutes the oil reservoir, into which the drivers dip, carrying up oil so that it reaches the clearances between the drivers and the walls of their guide ways 17, and by capillary action feeds up these, thus conveying oil to the cam-rolls 21 and their groove 20. This arrangement further supplies sufficient oil for lubricating the carriers, without excess. Capillary action causes oil to creep over metallic surfaces and this tendency augmented by the centrifugal action due to high speed of rotation of the turret, and restricted by the inclination of the drivers and their guide-ways, conveys enough oil, without surplus to the carriers and to their race-way 13.

It is vitally essential that the yarns x, as they sinuate among the carriers, shall be fully controlled and not susceptible to deflection by air currents, vibration of machine parts or of the machine itself due to unsubstantial setting. To insure such control I employ, what I term, an angle guide 54 which is formed as a "dove-tail" at its mid-section, where secured, to engage the "dove-tail" seat 54^a in the ring 10, at the thread-way 10^a—see Fig. 6. Referring to Fig. 6, the apex 55 of the angle groove 56 of the thread guide is below the path of travel of the point of the deck of the carrier 14, and the guide eye 57 of the take-up arm 58 of the lower supply is so located that the yarn x when in its mean position, or, in other words, when drawn directly from the eye 57 toward the braiding point 40, passes below the line of travel of the points of carrier decks and through the apex 55 of the angle guide. Further, the guide eye 57 is to one side of the straight line drawn from the braiding point 40 through the apex 55 of the angle guide, and in such direction that the yarn pulls into the apex so that it is under tension when it passes said guide and is therefore steadied against chatter and vibration and air currents. Thereby, it holds the yarn when the latter is not purposely deflected, to that position where it shall invariably and surely pass below the carriers through the channel or space 23. The angle guide also constitutes an abutment to resist deflection of the yarn in the direction of carrier's movement to secure prompt response in a vertical direction, and further, when the carrier does encounter the yarn, the upper inclined edge 66 of the angle guide coacts with the carrier to elevate the yarn, while the lower edge 67 coacts therewith to depress it.

The angle guide is held positively from vertical displacement by shoulders 68 which engage the track, the guide yielding elastically to permit such insertion.

The carriers are held down by the small foot pieces 59 and 60 in the carrier runner 61, which foot pieces engage the recess 62

of the carrier race 13. The foot piece 59 is permanently secured to the carrier by suitable means, such as a rivet and is of such length that it will enter the race 13 through the thread-way 10^a. After it has thus been entered the other foot piece 60 is applied. The latter has a stem 63, the extremity of which is beveled and has below the bevel a notch 64. On the deck of the carrier is a spring 65 which engages this notch, holding the foot piece 60 securely to its seat 64 in the carrier runner. This arrangement is peculiarly advantageous because it admits the use of a solid, integral ring 10, and avoids the difficulties and inaccuracies incident to the employment of a sectional ring or a ring with a removable section to admit the carrier.

The use of a single, independently controlled switch element or ring to control all the sinuating yarns, has peculiar merit because its "time" of action is not limited by any conjoined member of different function, but can be adjusted for its own best individual action. Because there is only one member and not a concatenation, the action on each yarn will not only be identical with that on every other yarn, but will remain so because there are no interconnecting joints between the switches 25 and therefore there is not felt the effect of cumulative backlash invariably developed in articulated mechanisms.

The self-lubricating system for the drivers and carriers is novel, and vital on account of the high speed to be maintained. In other words, the possible speed of mechanical action can be sustained only by perfect lubrication of the moving parts. Too little lubrication will cause seizing and wear, with consequent degeneration of action, yarn breakage, resultant waste and general impairment, both of product quality and quantity. Too much lubrication would drench the machine and its yarn and ruin the product. By the peculiar disposition of the machine parts, with the drivers so disposed as to recurrently dip into an oil supply, sufficient oil is drawn up to be distributed as above described, by capillary and centrifugal action, while the inclination of the drivers and of the surfaces with which they coact, opposes to these combined actions an "up-hill" resistance which supplies the necessary restricting effect to control the delivery of oil.

The bonnets 48 and 52 completely cover the internal mechanism, presenting surfaces readily cleaned and protecting the contained oil from fouling, and also the acting parts within.

Without limiting myself to the precise form of construction employed, I claim:

1. In a braiding machine, the combination with a turret rotating in one direction supporting two sets of yarn supplies, a second turret rotating in the opposite direction, drivers whereby one of the sets of supplies is moved in the same direction as the second turret, of a single switch member to control all of the yarns from the other set of supplies in passing the supplies of the set moving with the second turret and means to actuate the switch member.

2. In a braiding machine, the combination with two sets of yarn supplies moving in opposite directions, the yarns from one set sinuating through the supplies of the other set, of a single switch member to control all of the sinuating yarns and means to actuate that member.

3. In a braiding machine, the combination with a moving member supporting two sets of supplies, a second member moving adjacent the first and in opposite direction, means whereby one set of supplies is propelled with and by the second member, a single switch member to control all of the yarns passing by the supplies carried with the second member, and means to move the switch member.

4. In a braiding machine, the combination with a moving member supporting two sets of supplies, a second member moving adjacent the first and in opposite direction, means whereby one set of supplies is propelled with and by the second member, a single switch member carried with but movable on the second member to control the passage of yarns past the supplies carried with the second member, and a fixed cam, and means connecting the cam with the switch member to move the latter.

5. In a braiding machine, the combination with oppositely moving sets of supplies, of an outer turret to support both sets, an inner turret to propel one set, drivers to connect the inner turret with its set of supplies, operating in ways in the inner turret and operated by the first turret, a single switch member resting over the drivers, moving with the inner turret and having an independent oscillating movement thereon, means to impart the oscillating movement and means to drive the turret.

6. In a braiding machine, the combination with a frame 2 and ball bearings 4 and 7 thereon, of an outer turret riding on the ball bearing 4 supporting two sets of yarn supplies, an upper and a lower, an inner turret riding on the ball bearing 7, drivers carried by the inner turret and actuated by the outer turret, a switch ring to control the direction of travel of all the yarns from the lower supplies, carried with the inner turret and oscillated with respect thereto, a cam immovably connected with the frame to oscillate the ring, and operating connections between the cam and the switch ring.

7. In a braiding machine, the combination with a frame 2, a turret riding on the frame and two tiers of yarn supplies supported on

the turret, of an oil reservoir within the turret, and drivers to propel one tier of supplies conically arranged and operated, and dipping into the oil of the reservoir to distribute the oil.

8. In a braiding machine, the combination with a frame, of an outer turret having an inner surface of frusto-conical form and a cam groove in said surface, yarn supplies carried on the turret and movable with relation thereto, an inner turret and a head therefor conformed to the interior of the outer turret and having guide-ways formed in the head parallel to the frusto-conical surface of the outer turret, said inner turret having a movement of opposite direction to that of the outer turret, drivers sliding in the guide-ways and arranged to reciprocate in a plane parallel to the frusto-conical cam surface, means to engage the drivers with the cam groove of the outer turret, and driving means to operate the turrets.

9. In a braiding machine, the combination with a frame 2, having ball bearings 4 and 7, an outer turret 3 rotating on the ball bearing 4, having an interior frusto-conical surface, a ring 10 secured to the turret and a tier of yarn supplies fixedly secured to the ring, of a second tier of yarn supplies riding on the ring and carriers 10 therefor, an inner turret, and an oil containing head thereof conformed to the frusto-conical interior of the outer turret, drivers to propel the carriers with the inner turret, connections between the cam groove of the outer turret and the drivers whereby the latter are alternately engaged with the carriers and dipped in the oil of the reservoir to distribute the oil, and means to drive the turrets.

10. In a braiding machine, the combination with the frame of the machine and central standard thereof, yarn supplies and turrets to carry and propel the yarn supplies, interlacing devices to effect the braiding, and a rotatable bonnet to cover the interlacing devices, of a beater device comprising a tubular bearing mounted at the top of the standard, a reciprocating tubular member on said bearing, a cam on the rotatable bonnet to reciprocate the tubular member, a spider on the said member to engage the cam, and means to rotate the bonnet.

11. In a braiding machine, the combination with the frame of the machine and central standard thereof, yarn supplies and turrets to carry and propel the yarn supplies, and interlacing devices to effect the braiding, of a bonnet rotatably mounted on the central standard, propelling means connecting the bonnet with one of the turrets, and means to drive the turrets.

12. In a braiding machine, the combination with the frame of the machine and central standard thereof, a switch ring to control the interlacing of the yarns, a cam fixed to the frame to actuate the switch ring and operation connecting means intermediate the cam and ring including a lever 27 and fulcrum stud 37 therefor, and a beater to compact the braid, of a bonnet rotatably mounted on the central standard and engaging the stud, a beater cam mounted on the bonnet and means to rotate the bonnet and beater cam through the stud.

13. In a braiding machine, the combination with oppositely rotating turrets, oppositely revolving supplies supported on one of the turrets and a head for the other turret having an oil reservoir, of drivers in said head movable in inclined ways to propel a portion of the supplies with the second turret and to withdraw oil from the reservoir to lubricate the moving parts aforesaid.

14. In a braiding machine, the combination with oppositely revolving supplies and means to sinuate the yarns from some of the supplies among the other supplies to produce a braid, of drivers to propel one portion of the supplies, a turret with a frusto-conical portion in which are ways for the drivers and an oil reservoir into which the drivers recurrently dip to withdraw and distribute oil, another turret having a frusto-conical inner surface over which the drivers lie and to which they convey oil from the reservoir which surface is upwardly inclined from the reservoir to oppose the centrifugal tendency of the oil and has a cam groove to reciprocate the drivers. and means to operate the turrets and drivers.

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

SIMON W. WARDWELL.

Witnesses:
GRACE W. BROWN,
JAMES F. MCENERY.