Nov. 18, 1924.

1,515,608

D. H. MURPHY

BRAIDING MACHINE

Filed April 21 1923

2 Sheets-Sheet 1

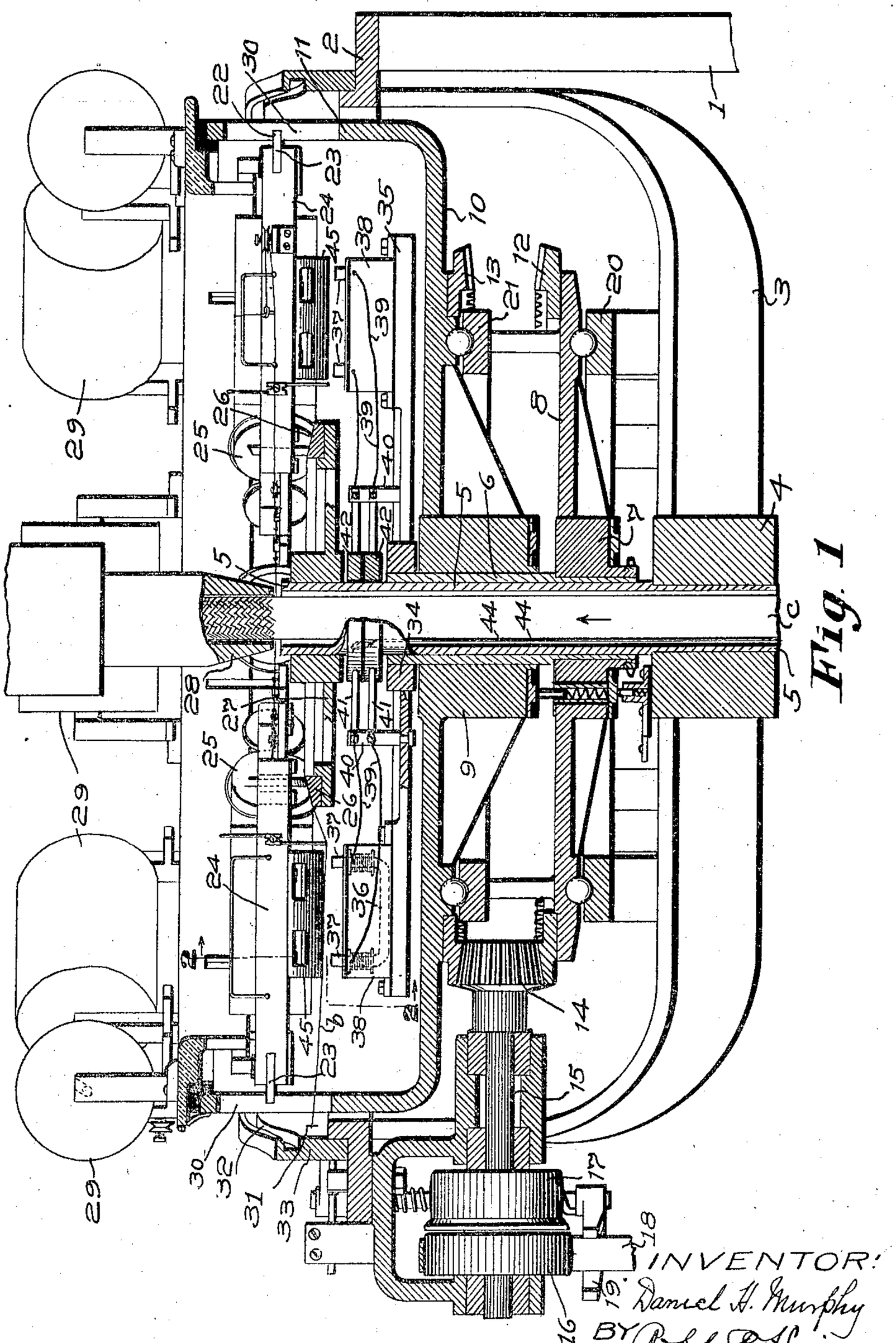

Fig. 1

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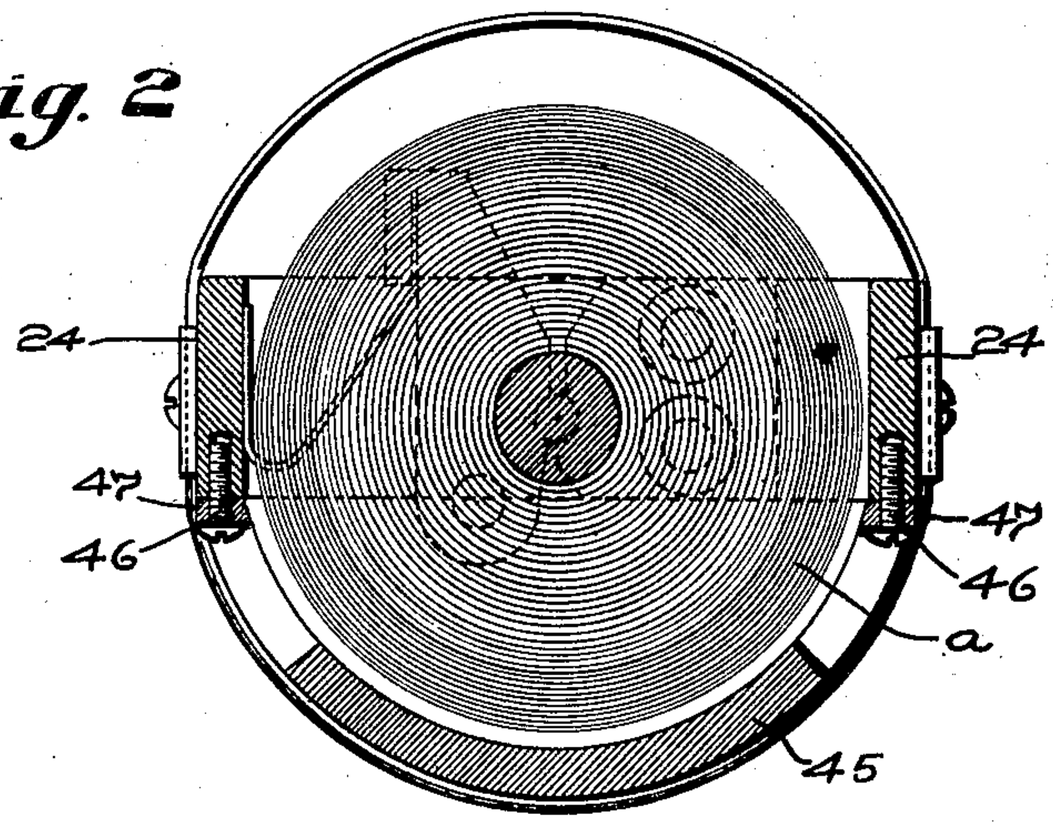
Fig. 2



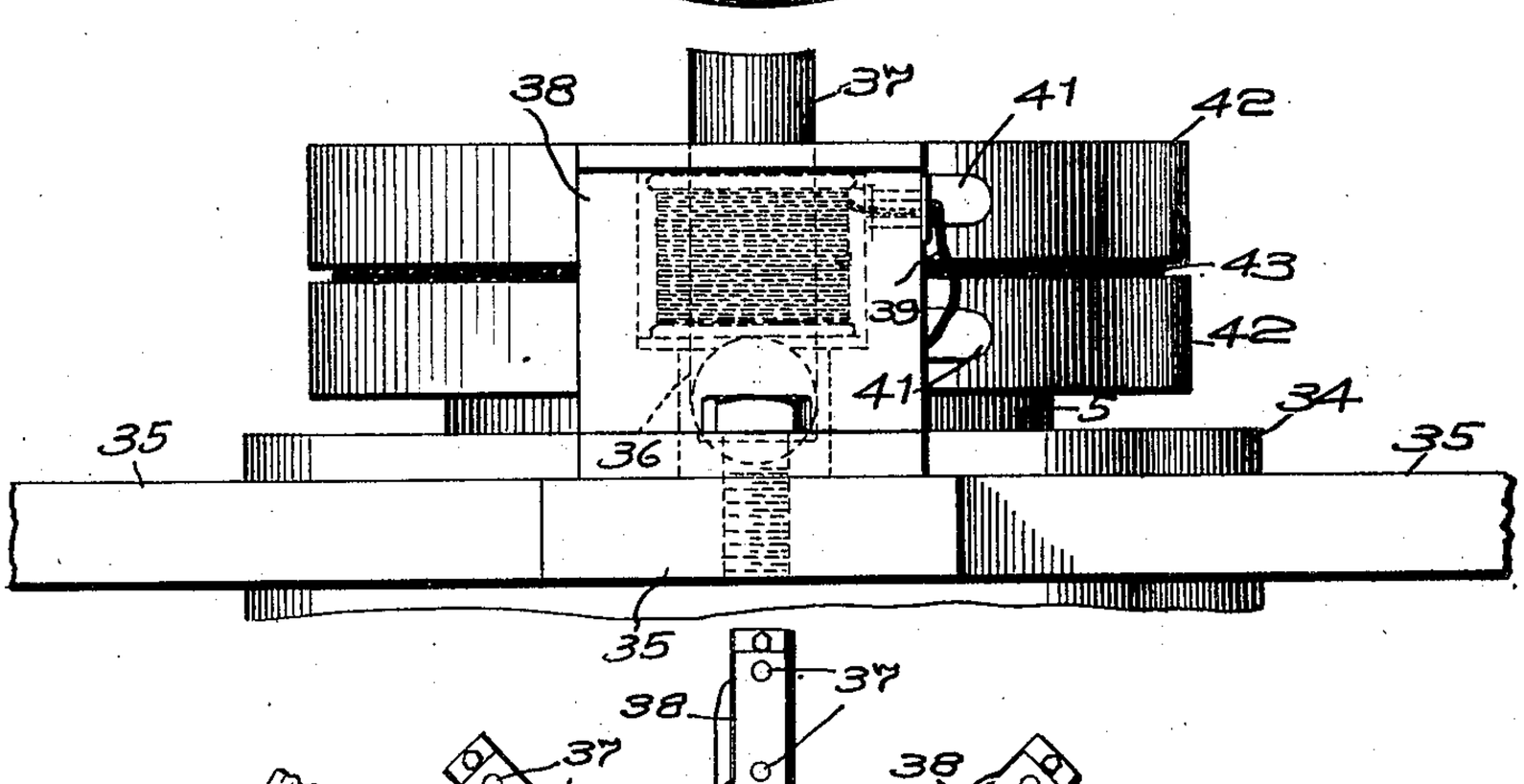


Fig. 3

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UNITED STATES PATENT OFFICE.

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BRAIDING MACHINE.

Application filed April 21, 1923. Serial No. 633,672.

To all whom it may concern:

Be it known that I, DANIEL H. MURPHY, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented an Improvement in Braiding Machines, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

This invention relates to braiding machines and more particularly to the means for traversing the yarn carriers in their annular paths.

It has been the common practice heretofore in machines of this type to provide a main rotary frame supporting yarn supplies and inner yarn carriers, and to traverse them in annular paths in opposite directions. During the operation of the machine, the yarn from the outer yarn supplies is passed alternately over and under certain of the inner yarn carriers in order to interlock the yarn in its braided formation, and the inner yarn carriers have usually been driven by means of pins or rotary drivers which engage the yarn carriers and between which and the engaged part of the yarn carrier the outer yarn has to pass when it is directed below the inner yarn carriers. This constantly recurring contact between the outer yarn and the driving means for the inner yarn carriers injuriously affects the outer yarn, frequently causing breakages and consequent stoppage of the machine with consequent loss of output.

One of the objects of the present invention is to provide an effective driving means for the inner yarn carriers which, while effectively moving the inner yarn carriers in their annular paths, shall not injuriously affect the outer yarn as it is passed between the inner yarn carriers and their driving means, the result being that the machine may be driven at high speed without the frequent stoppages due to breakage of the outer yarn, and consequent decreased output.

In accordance with the present invention, the inner yarn carriers are mounted for movement in an annular path about a central support and are each provided with an armature, and the driver frame has a series of electro-magnets which are moved in an annular path and by cooperation with the armatures of the carriers impart the movement thereto.

An important feature of the present invention, therefore, consists of a yarn carrier movable in an annular path and having connected therewith a soft iron plate constituting an armature, and an electro-magnet, preferably below the path of movement of the yarn carrier, for traversing the latter in its annular path during the annular movement of the electro-magnet. The poles of the magnet are a short distance removed from the soft iron plate or armature of the carrier, with the result that the outer yarn is not brought in contact with the driving means for the inner yarn carriers, as heretofore, and the machine is made susceptible of high speed without liability of breakage of the outer yarn and recurring stoppages of the machine.

In accordance with the present invention, the electro-magnet is mounted upon a rotatable driver frame and is connected to a source of electric current or supply through relatively movable contacts whereby the electro-magnet remains energized throughout its path of movement and by the attraction between the magnet and the soft iron plate of the armature or carrier causes the latter to travel in a circular path.

The above and other features of the invention and new combination of parts will best be made clear from the following description and the accompanying drawings of one good, practical form of the invention, it being understood that the details may be varied within the true scope of the invention as defined by the claims.

In the drawings:

Fig. 1 is a central section through a braiding machine containing the present invention;

Fig. 2 is an enlarged cross-sectional detail on the line 2—2 of Fig. 1, showing the relation of the yarn carrier, the soft iron plate or armature, and the electro-magnet driver and connected parts; and

Fig. 3 is a detached detail showing more particularly the driver frame and the parts carried and actuated thereby.

The term "yarn" as herein employed will

be used in its broad sense to include any usual kind of filament such, for instance, as cotton, wool, silk or wire, any one of which may be appropriately employed in connection with the present invention, and while the advantages of the invention are best manifested in a braiding machine of the general type hereinafter described, it will be understood that the invention is not limited thereto and may be employed in connection with any yarn carrier which is moved in a circular path during the machine operation.

Referring more particularly to Fig. 1, the machine frame comprises the standards or uprights 1 which are surmounted by a table or platform 2 from which depends the yoke frame 3 supporting a fixed bearing 4 to which is rigidly secured the central tubular support 5. The central tubular support 5 has mounted thereon for rotative movement the sleeve 6 to which is secured the hub portion 7 of the driver gear 8, and loosely mounted on the rotating sleeve 6 is the hub portion 9 of the main rotary frame 10 having the upward extension or flange 11, and in effect constituting a drum.

Secured to the driver gear 8 is the circular rack 12 opposed to which and secured to the main rotary frame 10 is the similar circular rack 13, each of which is connected with a beveled gear 14 mounted on the drive shaft 15 on which is mounted the fast and loose pulleys 16 and 17. A belt 18, actuated from a suitable source of power, imparts motion to the mechanical parts when transferred by the belt shipper 19 on the fast pulley.

The driver gear and the main rotary frame are supported by suitable ball races 20 and 21.

The upward extension 11 of the main rotary frame is provided with an annular raceway 22 in which travel the shoes 23 of the inner yarn carriers, each of which in the present instance of the invention comprises the side frames 24 and between these is mounted the inner yarn supply *a*, best shown in Fig. 2. The shoes 23 of the inner yarn carriers serve to not only guide the yarn carriers in their annular path, but to support the outer portions thereof, while the inner portions of the carriers are supported by rollers 25 which rest upon a race or track 26 carried by the fixed frame 27 secured to the central tubular support 5, the construction being such that as the carriers move in their annular paths about the braiding point 28, they are supported at their outer and inner ends preferably with the axes of the yarn mass in each carrier directed towards the central braiding point.

The outer yarn supplies 29, are in the present instance, mounted upon the extension 11 of the main rotary frame, and the yarns from the supplies pass downward to the guide arms 31 and are led through openings 30 towards the braiding point 18, as is hereinafter more fully described.

The means for alternately directing the outer yarn *b* above and below the inner carriers as the main rotary frame and inner carriers move in opposite directions in their annular paths may be effected by a guide arm 31, diagrammatically shown in Fig. 1, and operated from a cam path 32 formed in a ring 33 mounted upon the table 2, but since the details of this feature form no essential part of the present invention, it is not hereinafter elucidated.

In the present instance of the invention, the inner and outer yarns are shown as being braided about a central core *c* which extends upwardly through the tubular central support 5, and as the inner and outer yarns are braided upon the core at the braiding point, the completed and covered core is taken up by a take-up mechanism which forms no part of the present invention. Instead of braiding the inner and outer yarns upon a core, as shown in the present instance, it will be understood of course that the fabric may be made as a tubular fabric without a core.

Secured to the rotatable sleeve 6 above the hub portion 9 of the main rotary frame is the driver frame 34 which consequently rotates with the driver gear, and as shown in the present instance, is formed of spider arms 35, Fig. 3. Preferably there is the same number of spider arms 35 on the driver frame as the number of inner yarn carriers and each spider arm has mounted thereon an electro-magnet 36 the poles 37 of which extend upwardly into close proximity to but not in contact with the soft iron plate or armature carried by each of the inner yarn carriers, to be presently described.

The electro-magnets may be secured to the spider arms 35 in various ways, but inasmuch as it is desirable to protect the electro-magnets from the accumulation of lint and other extraneous or objectionable substance, each electro-magnet is enclosed by a casing 38, and the conductors 39 for energizing the magnets lead from the usual coil about the magnets to a post 40 secured upon the driver frame where they are connected electrically to the wipers 41, the inner ends of which have sliding electric connection with the contacts 42 respectively, secured to the fixed central tubular support 5.

Each of the contacts 42 is insulated from the central tubular support 5, as shown in Fig. 1, and also from each other by suitable insulating material 43, and said fixed contacts 42 are connected by electric conductors 44 which lead downwardly through the central tubular support 5 to the source of electric supply, the construction being such that as the driver frame 35 rotates in its circular path, the wipers 41 ride over the surfaces of the contacts 42, and maintain a constant elec-

trical connection with the source of supply to thereby keep the electro-magnets energized during their rotative movement.

As hereinbefore noted, each of the inner yarn carriers has connected to it a soft iron plate which constitutes an armature for co-operation with the electro-magnets. In the present instance the soft iron plate 45 is suspended from its associated carrier below the inner yarn mass mounted in the carrier. As a convenient means of supporting the soft iron plate 45, the latter may be secured to the side frames 24 of the carriers by means of the screws 46, Fig. 2, which pass through a flange portion 47 of the soft iron plate or armature and are threaded into or otherwise secured to the side frames 24 of the carrier.

The soft iron plate 45 extends longitudinally below the carrier to which it is secured and the poles of the electro-magnet are preferably disposed near the end portions of the soft iron plate so that in the annular path of movement of the carrier, each end portion of the carrier may be held to its appropriate line of travel in its circular path, it being understood that the circular path of the outer portion of each carrier is of greater diameter than the inner path, so that being separated, the poles of the electro-magnet as described and having the soft iron plate of the carrier extending radially from the braiding point or longitudinally of the carrier, the inner and outer portions of the carrier are caused to maintain their prescribed circular path of movement and the machine as a consequence may be run at high speed.

From the construction described, as a good practical form of the present invention, the outer yarn *b* from the outer yarn supplies may be passed between the carriers and driving means or electro-magnets without injurious contact with either, and all abrasion or rubbing action against the arm as it passes between the carrier and its driving means is avoided.

What is claimed is:

1. In a braiding machine, the combination of a main rotary frame having an annular trackway, a central tubular shaft about which the frame rotates, outer yarn supplies movable with the main rotary frame, a series of inner yarn carriers mounted in the annular trackway for movement in a horizontal plane and each provided with an iron portion constituting an armature, a rotary driver frame movable in a horizontal plane below the inner carriers, electro-magnets upon the driver frame and adapted to attract the armatures and impart the rotative movement of the driver frame to the carriers, fixed contact rings supported by but insulated from the upper portion of said tubular shaft, electric conductors mounted within the tubular shaft and extending from a source of current supply to said rings, and electric connections between the electro-magnets and contact rings including wipers mounted upon the driver frame to travel over the surface of the fixed rings.

2. In a braiding machine, in combination, a fixed hollow shaft, a sleeve rotatably mounted upon the shaft, a main rotary frame mounted for rotation about said sleeve and having an annular trackway, a series of inner yarn carriers mounted in the annular trackway for movement in a horizontal plane and each provided with an iron portion constituting an armature, means for rotating the sleeve in one direction and the main rotary frame in the opposite direction, a rotary driver frame secured to the sleeve and rotated thereby in a horizontal plane, electro-magnets upon the driver frame and adapted to attract the armatures and impart the rotative movement of the driver frame to the carriers, and electric connections between the magnets and source of electric supply, including contact rings supported by the upper portion of the hollow shaft above said sleeve, conductors within the hollow shaft leading to said rings, and wipers engaging the rings and secured upon the rotary driver frame.

3. A high-speed braiding machine comprising in combination, a main rotary frame having an annular upwardly extending wall and a groove raceway formed in the inner face of the wall, outer yarn carriers mounted upon the rotary frame to travel therewith, a series of horizontally disposed inner yarn carriers, means for supporting the inner yarn carriers at both ends so that their axes extend in a horizontal direction radially of the axis of the braiding machine, comprising an annular track, rollers at the inner ends of the carriers that roll upon said tracks, and shoes at the outer ends of the carriers that extend in a horizontal direction into said groove to support the carriers without engaging the outer yarns, a rotary driver frame supported below the inner carriers, electro-magnets upon the driver frame adapted to attract the inner carriers and impart the rotative movement of the driver frame to them without engaging the carriers so that only the supporting means at the inner ends of the carriers engage the outer yarns, and electric connectors between the magnets and source of electric supply.

4. A braiding machine comprising in combination, a main rotary frame having an upstanding wall and a groove raceway in the inner face of the wall, outer yarn carriers mounted upon the rotary frame to travel therewith, a series of horizontally disposed inner yarn carriers, means for supporting inner yarn carriers at both ends so that their axes extend radially of the vertical axis of the braiding machine, comprising an annu-

lar track, rollers at the inner ends of the carriers that roll upon said track, and shoes at the outer ends of the carriers extending into said groove and adapted to take the outward thrust of the inner carriers produced by centrifugal force and arranged to support the inner carriers without engaging the yarn passing inwardly from the outer carriers, a rotary driver frame supported at one side of the plane of the inner carriers, electro-magnets upon the driver frame for traversing the inner carriers without engaging them, means for rotating the main rotary frame and driver frame in opposite directions, and electric conductors for energizing the magnets.

In testimony whereof, I have signed my name to this specification.

DANIEL H. MURPHY.