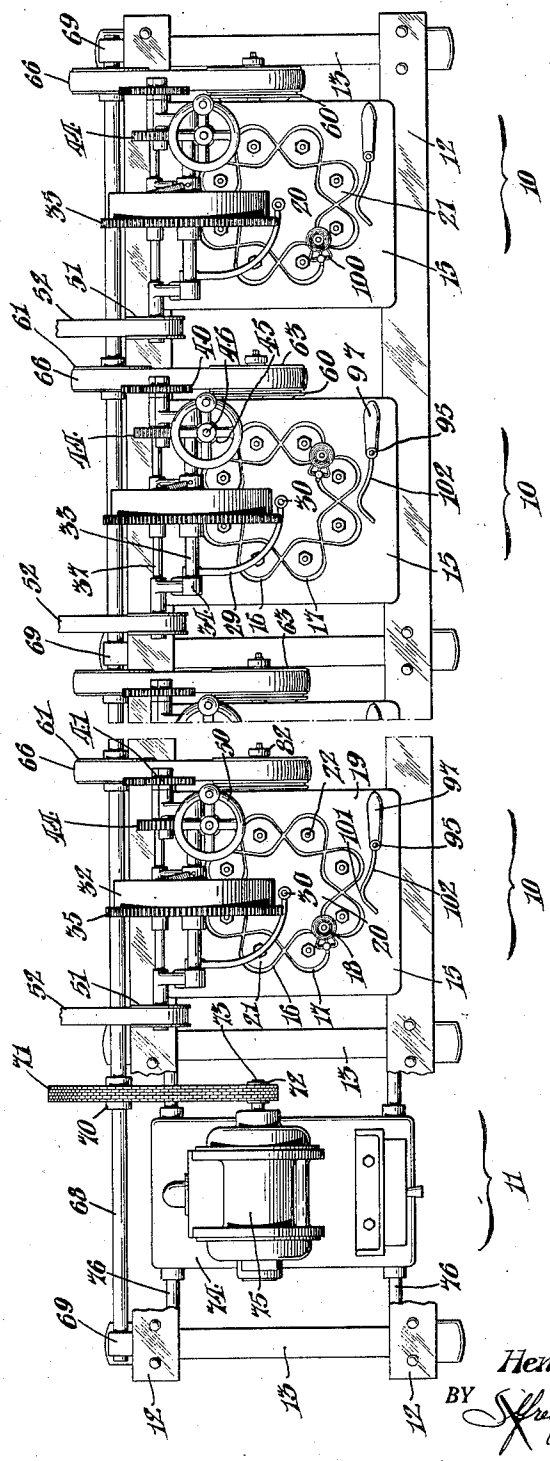
Nov. 23, 1937. H. JANSSEN 2,099,933

MULTISECTION BRAIDING MACHINE

Filed April 6, 1935 4 Sheets-Sheet 1

Fig. 1.



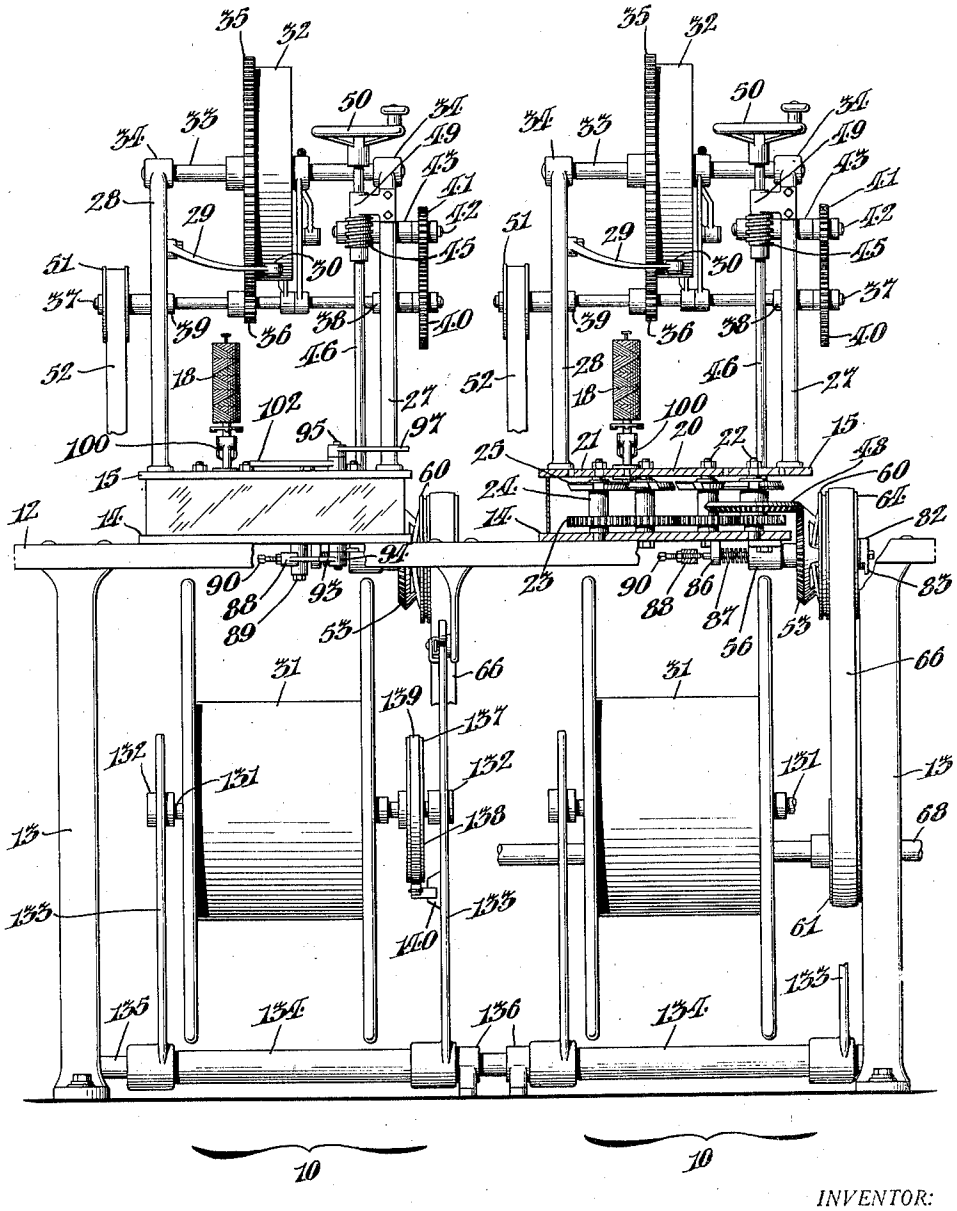
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MULTISECTION BRAIDING MACHINE

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FIG. 2.



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MULTISECTION BRAIDING MACHINE

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FIG. 3.

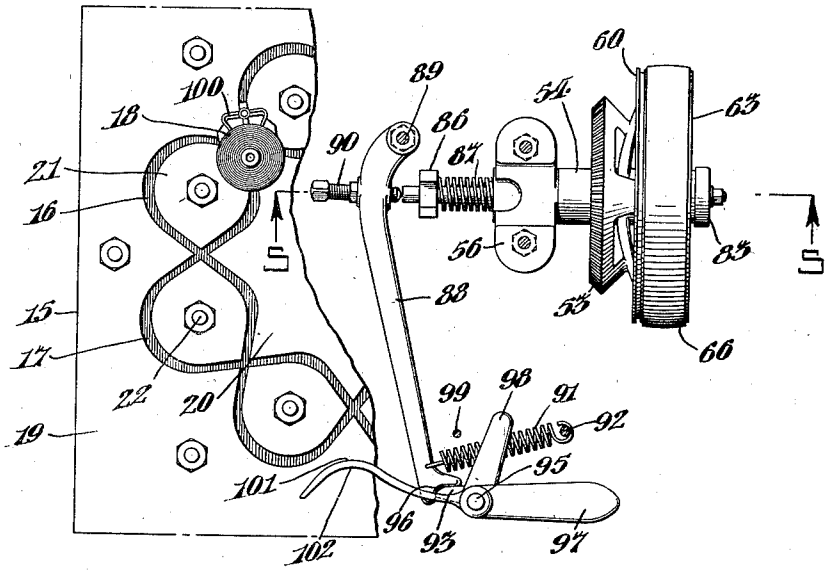
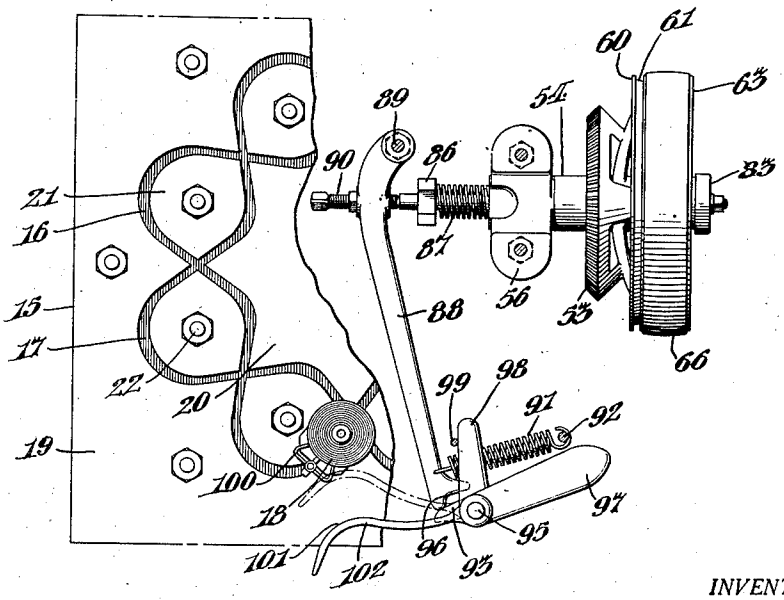


FIG. 4.



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MULTISECTION BRAIDING MACHINE

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FIG. 5.

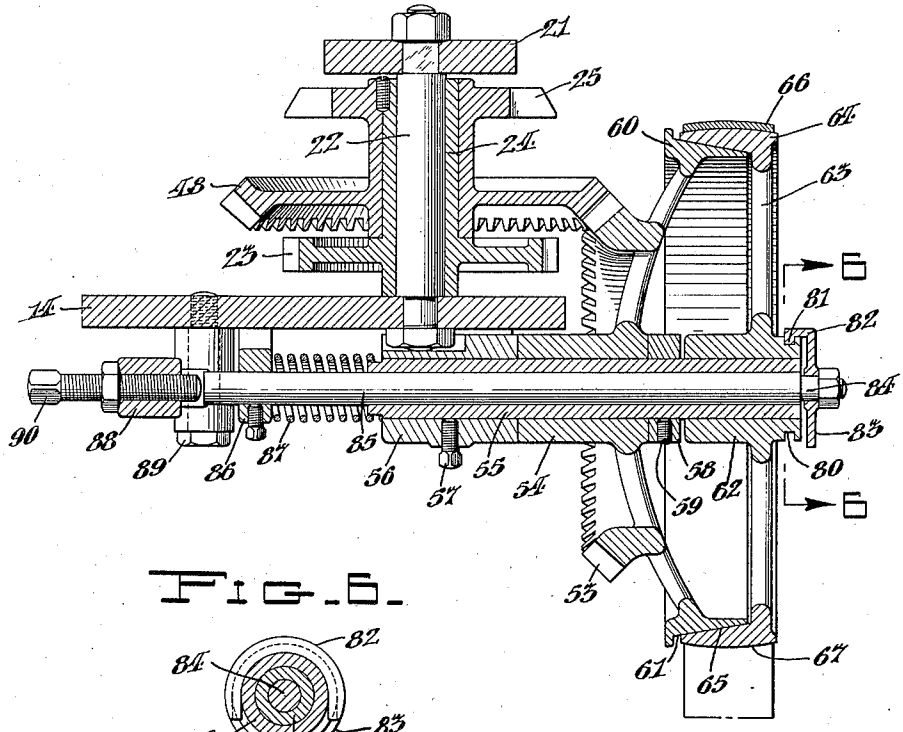
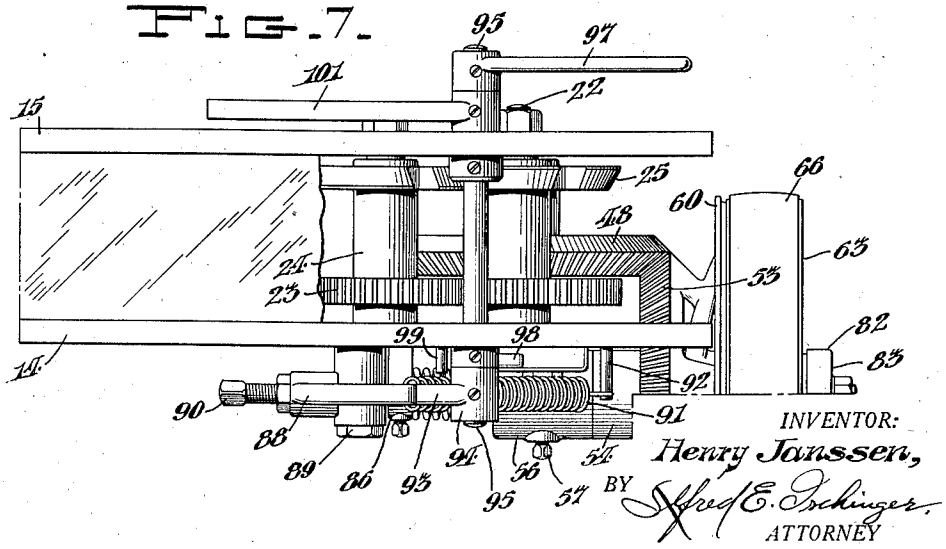


FIG. 6.

FIG. 7.



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UNITED STATES PATENT OFFICE

2,099,933

MULTISECTION BRAIDING MACHINE

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Application April 6, 1935, Serial No. 15,048

7 Claims. (Cl. 96—19)

This invention relates to braiding machines, and particularly to those of the multisection type, wherein a number of otherwise independent braiding heads, sections, or units are arranged side-by-side in a battery or bank on a single main supporting frame; and wherein the several units are driven from a single source of power common to all the braiding heads.

In the present instance, the common source of power comprises an electric motor operatively connected to a main drive shaft which latter extends substantially the full length of the common supporting frame and from which power is supplied to each braiding unit, through driving mechanism individual to the unit.

Machines of this type function at relatively high speeds. Due to the high rate of speed at which the machines operate, and due to the compactness of the battery, necessitating the use of relatively small bobbins in the various braiding carriers, it is necessary for the attendant to actuate the individual units manually from time to time in replenishing bobbins and for performing other duties necessary to keep the machine as a whole continuously in operation. Therefore, in order to obtain maximum efficiency from the operator throughout a normal working day, to maintain maximum production of the battery, it is necessary that the operator expend a minimum of effort at such times as it becomes essential to operate the individual units by hand.

One object of my invention is to provide an arrangement whereby a braiding machine may not only be stopped automatically upon the breakage of a thread but may be started again smoothly to avoid chatter and jerks on the threads.

Another object of the invention is to provide a novel means whereby the clutch may be very quickly and easily thrown out of and into operation.

Another object of the invention is to provide a simple and efficient mechanism for disconnecting the respective units from the common source of power.

A further object of the invention is to provide a compact arrangement for a braiding machine particularly to increase the space efficiency and operator efficiency of multiple unit braiding machines.

With these and other objects in view, which will become apparent from the following detailed description of the illustrative embodiments of the invention shown in the accompanying drawings, my invention resides in the novel elements, features of construction and arrangement of parts in cooperative relationship, as hereinafter more particularly pointed out in the claims.

In the drawings:

Figure 1 is a plan view of a multi-section braiding machine, with the intermediate portion thereof removed and a portion of the main frame at one end of the machine broken away;

Fig. 2 is a front elevation, partly in section, illustrating a pair of the braiding units shown in Fig. 1;

Fig. 3 is an enlarged fragmentary plan view illustrating the controlling mechanism for one of the braiding units as being in the "running" or "set" position;

Fig. 4 is a view similar to Fig. 3 and showing the same mechanism as being in its "tripped" or "stop" position;

Fig. 5 is an enlarged sectional view taken substantially on the line 5—5, Fig. 3, and including parts not shown in Fig. 3;

Fig. 6 is a sectional elevation taken on the line 6—6, Fig. 5; and

Fig. 7 is an enlarged front elevation of a portion of the mechanism shown in Fig. 2 with a part of the outer casing broken away to disclose more clearly the operation of the control mechanism.

Referring more particularly to Figs. 1 and 2 of the drawings, the multi-section braiding machine chosen for the purpose of illustrating the present invention comprises a plurality of braiding heads or units 10, 10 which together, with a single power supply unit 11, are mounted on a main frame common to all of said units. The main frame in the present instance comprises a pair of laterally spaced parallel top rails 12, 12 which extend longitudinally of the machine and which are supported by and are suitably secured to a plurality of transversely extending laterally spaced cross frame members 13, 13.

Each braiding unit 10 in the present instance comprises a base or bed plate 14 which bridges the space between the longitudinal frame members 12, 12 transversely of the machine and functions as the main support for all of the elements of the unit, whereby the units may be bodily removed as such without affecting one another.

Spaced above and parallel to the bed plate 14, in each instance, is a raceplate 15 which is provided with a pair of intersecting sinuous raceway slots or paths 16 and 17. The pathways 16 and 17 are adapted to guide a series of bobbin

carriers one of which is shown at 18 through the braiding operations, one portion of the series of carriers moving in one direction through one of said paths while the remaining carriers of the series move in the opposite direction along the second of said paths.

Due to the intersecting continuity of the slots 16 and 17 the raceplate is composed of a marginal portion 19, a central portion 20, and a series of small intermediate portions 21, which latter are normally referred to as quoits or tellers, said marginal, central and intermediate portions being independently supported from the bed plate 14 by a series of vertically extending shouldered studs 22.

Rotatably mounted on those of the studs 22, which respectively support the tellers 21, is a series of spur gears 23, 23. In the present instance, each gear 23 is formed or otherwise mounted on the lower end of a hub or sleeve 24, the upper end of which is provided with a radially notched disc 25. The notches of the discs are adapted to engage depending lugs formed on the under sides of the bobbin carriers 18, for advancing the carriers over the surface of the raceplate 15 during the normal braiding operation of the unit.

The assemblage 23—24—25 is commonly referred to as "horn gear." The disc 25 in some instances is replaced by lugs or horns formed directly on the gear 23.

The gears 23 mesh one with the other to form a continuous train, which may be arranged in a continuous closed circle or in a form where the circle is open at one side. In either case, rotary motion applied to any one of the gears 23 will transmit a corresponding motion to each and all of the gears of the train.

Projecting vertically from and supported by the raceplate 15 in the present instance, is a pair of standards 27 and 28. Extending laterally from the standard 28, in the present instance, is an arm 29 at the outer end of which is formed or mounted an eye 30, which latter constitutes and establishes the braiding point of the unit.

In the present instance, the braiding point 30 is disposed in vertical axial alignment with the common center of the intertwining carrier pathways 16 and 17. In the present instance, the raceplate 15 and the bed plate 14 are bored in axial alignment with the braiding point 30 which may be used for the passage of a core thread, wire, tube or other element around which a braided jacket is to be provided by the interbraiding operations of the carriers 18. When no core is used, the yarns from the bobbins are braided at the point 30 in a known manner.

The core element, when used, is arranged to be drawn upwardly through the plates 14 and 15 and the braiding point eye 30, from a reel 31 which is rotatably mounted about a horizontal axis below the bed plate 14, by a take-up drum 32 arranged with its periphery substantially tangent with the vertical aligned axes of the plates 14 and 15 and the braiding point 30 of the machine.

The take-up drum 32 is rotatably mounted on a horizontally disposed shaft 33 which may be rotatably or stationarily mounted in bearings 34, 34 formed in the upper ends of the standards 27 and 28 respectively.

Rotatably mounted about the axis of the shaft 33 and operatively connected to the take-up drum 32 is a gear 35. The gear 35 and the drum 32 are adapted to be driven by a pinion 36 which is secured to a horizontally disposed shaft 37 which is rotatably mounted in bearings 38 and 39 formed on the standards 27 and 28 respectively.

Adjacent the bearing 38, the shaft 37 is provided with a gear 40. The gear 40 meshes with a second gear 41 which is secured to a short horizontal shaft 42. The shaft 42 is rotatably mounted in a bearing 43 formed on and carried by the standard 27. At the opposite end of the shaft 42 from the gear 41 is a worm wheel 44, see Fig. 1. The worm wheel 44 is adapted to be driven by a worm 45 which is secured to a vertical shaft 46.

The lower end of the shaft 46 has bearing in one or both of the plates 14 and 15 intermediate which the said shaft is provided with a spur gear disposed in the plane of and meshing with one of the gears 23 of the carrier driving train.

The upper end of the shaft 46 is rotatably mounted in a bearing 49 secured to or forming part of the standard 27 and above the bearing 49 said shaft is provided with a suitable hand wheel or crank 50 by which normal braiding operations of the unit may be manually effected, the lower end of said shaft through the train of gears 23 effecting normal braiding operations of the carriers 18 while the upper end of the shaft, through the train of gears driven by the worm 45, effects take-up of the braided product at a predetermined rate according to the nature of the finished product desired.

In the present instance, the shaft 37 is provided with a grooved or flanged pulley 51 which, through a suitable belt 52, drives a suitable take-off mechanism (not shown) by which the finished product is carried away from the take-up drum 32.

Mechanical power is supplied to each unit through a bevel gear 48 which is carried by the hub section 24 of one of the horn gears 23. In the present instance, the bevel gear 48 meshes with the bevel gear 53 having a hub 54 which is freely rotatably mounted on a horizontally disposed tubular shaft 55.

The tubular shaft 55 is rigidly mounted in a bracket or bearing 56 which is suitably secured to the underside of the bed plate 14. Longitudinal and rotary motion of the tubular shaft 55 relative to the bearing bracket 56 is prevented by means of a set screw or other locking device 57, as clearly shown in Fig. 5.

The hub 54 of the bevel gear 53 is rotatably mounted on the tubular shaft 55 intermediate one side of the fixed bearing or bracket 56 and a collar 58 which is secured to the tubular shaft 55 by a set screw 59. The bevel gear 53 is provided with an annular rim 60. The peripheral face of the rim 60 is in the form of a frustrum of a cone.

Freely rotatably mounted on the tubular shaft 55 is the hub 62 of a driving pulley 63, the rim 64 of which is provided with an internal frusto-conical surface 65 which is arranged to engage the exterior frusto-conical surface 61 of the driven wheel 53 for applying power to the braiding unit.

This power is applied by means of a belt 66 riding the exterior crown face 67 of the rim 64 of the driving pulley 63. The power applied by the belt 66 is derived from a pulley 61 which is secured to the main drive shaft 68 of the machine.

The main drive shaft 68 extends parallel to the main rails 12 of the machine and is rotatably mounted in bearings 69 formed on or secured to the cross frame members 13, 13 respectively. On the main shaft 68 there is one driving pulley 61 for each of the braiding units 10.

Also secured to the main shaft 68 is a gear or sprocket wheel 70. In the present instance, the sprocket wheel 70 is connected by a suitable drive chain 71 with a sprocket pinion 72 which is mounted on one end of the armature shaft 73 of an electric motor 75. The motor 75 constitutes the sole source of power for the plurality of braiding heads constituting the multisection braiding machine.

The motor 75 is mounted on a platform 74 which in turn is mounted on longitudinally extending frame members or tie rods 76, 76. The platform 74 also supports the main switch and rheostat and/or other controlling means for the motor 75.

In order to connect and disconnect the individual braiding units to and from the main common drive shaft 68 the hub 62 of the driving pulley 63 of each unit is provided with a circumferential groove 80. Riding in the groove 80 in each instance is a substantially semi-circular rib 81 which is formed on the inside of a correspondingly shaped laterally extending flange 82 formed around the upper edge of a vertically disposed shifting disc 83.

The shifting disc 83 is secured to an outer shouldered end 84 of a shift rod 85 which is slidably mounted in the axial bore of the stationary tubular shaft 55. The opposite end of the shift rod 85 projects beyond that end of the tubular shaft 55 which is rigidly mounted in the bracket 56.

Secured to the projecting end of the shift rod 85, in spaced relation to the bracket 56, is a collar 86. Encircling the shift rod 85 intermediate the collar 86 and the bracket 56 is a spring 87 which at all times tends to move the shift rod axially in a direction to cause and maintain cooperative frictional engagement between the interior conical surface 65 of the driving pulley 63 and the exterior conical surface 61 of the driven wheel 53.

Disconnection of the driving pulley 63 from the main drive wheel 53 of each unit is accomplished by mechanism shown in Figs. 3 to 7 inclusive and which consists of a clutch lever 88 which is pivotally mounted on the stud 89 secured to and depending from the bed plate 14 in each unit. The clutch lever 88, in axial alignment with the shift rod 85, is provided with an adjustable abutment in the form of the set screw 90.

Secured to the free end of the clutch lever 88 is one end of a clutch-releasing spring 91, the opposite end of which is secured to any fixed part of the machine, as for example a stud 92 projecting downwardly from the underside of the bed plate 14. The strength of the spring 91, plus the leverage afforded by the length of the lever 88 beyond the abutment 90, is such that, unrestricted, the spring 91 will overcome the clutch-engaging spring 87 which maintains driving contact between the cooperating conical surfaces of the wheels 53 and 63 respectively and will move the shift rod 85 axially within the tubular shaft 55 sufficiently to shift the drive pulley 63 on the tubular shaft 55 and with respect to the wheel 53, whereby the cooperative engagement between the conical surfaces 61 and 65 is broken and whereby the mechanical power is completely disconnected from the unit, permitting the unit to be manually actuated by means of the hand wheel or crank 50.

Due to the fact that there is but one freely revolvable element, i. e. the clutch-gear 53—60, between the movable parts of the unit and the mechanical driving element 63 for the unit when the mechanical driving power of the machine is disconnected from the unit, the unit may be manually actuated with a minimum of effort on the operator's part.

Normally the clutch-releasing lever 88 is maintained in an inoperative position by means of a nose 93 formed on the outer end of a lever 94 (Fig. 2). The lever 94 is secured to the lower end of a control shaft 95 which is rotatably mounted in suitable bearings in the vertically spaced bed and raceplates 14 and 15 respectively. The nose 93 of the lever 94 is arranged to seat in a socket 96 formed in the outer end of the clutch-release lever 88.

Above the raceplate 15 the control shaft 95 is provided with a handle 97 by which said control shaft may be rocked to move the nose 93 of the stop lever 94 into or out of the socket 96 of the release lever 88, whereby the spring 91 may be held inoperative or may operate to swing the clutch lever 88 about its pivot to effect release of the mechanical power from the unit.

Rocking motion of the shaft 95 is limited by means of a finger 98 on said shaft 95 engaging a stop pin 99 which depends from the underside of the bed plate 14.

Should one of the threads carried by any one of the carriers 18 break or become exhausted the control shaft 95 will be automatically rocked to release the lever 88, by means of a drop weight or other thread-tensioning element carried by each bobbin carrier 18 dropping to a plane wherein, as the carrier is advanced in either the pathway 16 or 17 as the case may be, the trip element 100 will contact with a cam surface 101 formed on a trip lever 102 which is secured to the control shaft 95, such contact of the carrier-controlled trip element 100 causing a tripping of the stop lever 94 whereby the clutch release lever 88 is permitted to operate for disconnecting power from the unit causing the unit to come to rest automatically.

The end of lever 88 is rounded and stop 99 is so placed that said rounded end catches against the rounding surface of nose 93. Therefore, lever 88 can be thrown back from the position in which it appears in Fig. 4 to that shown in Fig. 3 merely by turning handle 97 and the nose 93 automatically seats in socket 96 to latch the parts in position to permit engagement of clutch parts 60 and 64.

The core material reel 31 is provided with a shaft or trunnion 131, which is rotatably mounted in suitable bearings 132 carried by a rockable frame comprising a pair of levers 133, 133 secured to a hollow or sleeve shaft 134. The sleeve 134 is loosely carried by a supporting shaft 135 which is supported at its opposite end by succeeding cross frames 12 and intermediate its ends by foot brackets 136, Fig. 2, which arrangement permits ready replacement of the supply reels 31.

The speed with which the core material is drawn from the supply reel 31 and fed to the braiding unit, and, likewise, the speed at which the finished product is drawn from the braiding point 30 and fed to the take-off reel (not shown) is determined by the rotative speed of the guide or take-up reel 32 under resistance afforded by a suitable brake 137, which in the present instance comprises a brake drum 138 secured to the trunnion shaft 131 and encircled by a brake band 139 which is caused to slide relative to the drum 138 in manner necessary to exert a braking action thereon through means of lug 140, carried by one of the supporting levers 133, against

which an offset portion of the brake band 139 abuts.

From the above, it will be obvious that as soon as the shaft 95 is rocked sufficiently to effect release of the lever 88, said lever effects complete disconnection of the power from the braiding unit with which it is specifically connected whereupon the disconnected unit is a separate and distinct machine in itself and in no way affects or is affected by the operation of the adjacent or any other of the units of the multi-section machine and may be readily actuated manually as a separate machine with a minimum of effort on the attendant's part.

By the above described arrangement of a gear on one of the clutch members driving directly on one of the train of horn gears, a very compact arrangement is obtained promoting both space efficiency and efficiency of the operative. Further, it facilitates a compact arrangement of the shift rod, springs and automatic stop.

Of course, the improvements specifically shown and described, by which the above results are obtained, may be changed and modified in various ways without departing from the invention herein set forth and hereinafter claimed.

I claim:

1. In a braiding machine having bobbin carriers in combination, a friction clutch having a driving member and a driven member, a shifting member for engaging and disengaging said driving and driven members, a spring for biasing said shifting member toward the engaging position, an operating lever member mounted to move freely away from said shifting member and to contact it when moved in the opposite direction, a second spring arranged to throw said operating member against said shifting member and having strength to overcome said first spring, latch means for holding said operating member against said second spring to cause the clutch to be operated by said first spring comprising a shaft having a nose with a surface in the form of a smooth curve arranged, when the clutch is operative, to seat in a similarly formed recess in said lever member and said lever having a rounded knob adapted and arranged, when the clutch is inoperative, to bear against said smooth surface to hold said lever against said second spring, a finger fixed to said shaft, a stop arranged to contact said finger to prevent said knob from passing off said curved surface, a handle fixed to said shaft for swinging said nose back into the recess in the lever, a cam finger fixed to said shaft, a part carried by a bobbin carrier of the machine and arranged to be held out of contact with said cam finger by a thread being wound and to drop into position to contact said cam finger upon breakage of said thread, said cam finger and thread released part arranged to act to throw said nose out of its socket in said lever member.

2. In a braiding machine having bobbin carriers in combination, a friction clutch having a driving member and driven member, a shifting member for separating and contacting said driving and driven members, a spring for biasing said shifting member toward the active clutch position, a lever arranged to contact the shifting member to throw the clutch to the inactive position and mounted on a pivot at one side of the line of said shifting member, a pivoted shaft on the other side of said shift member from said pivot, a spring connected to said lever and arranged when free to act to overpower said first spring to throw the clutch to inoperative position, a projection fixed to said shaft and arranged to swing into the path of a part on said lever to hold said lever against said second spring when the clutch is to operate and to release said lever when desired, a cam finger fixed to said shaft and arranged to receive an impulse to turn the shaft to release said lever, and a means on a bobbin carrier to deliver a turning impulse to said finger upon breakage of a thread.

3. In a braiding machine having bobbin carrying elements in combination, a friction clutch adapted and arranged to drive said machine and to ensure for it freedom from driving impulses when desired, a spring means for throwing said clutch into driving position, a second spring means arranged when unrestrained to overpower said first spring means but free from connection with said first spring means, latch means for holding said second spring means to cause said first spring means to actuate the clutch, and means for releasing said latch means upon the breaking of a thread.

4. In a braiding machine having bobbin carrying elements in combination, a friction clutch adapted and arranged to drive said machine and to insure for it freedom from driving impulses when desired, means including a straight rod and a spring acting thereon for throwing said clutch into driving position, a lever pivoted to swing against said rod to throw said clutch out of driving position, a second spring connected to said lever and adapted and arranged when under strain to overpower said first spring, and a latch to hold said lever against said second spring in stable inoperative position whereby the clutch is thrown into operative position by said first spring, and means for tripping said latch to release said second spring upon the breaking of a thread.

5. The combination with a multiple unit braiding machine including driving means common to all of the unts, of means associated with each unit for connecting the unit to, and disconnecting the same from, said driving means, comprising a bearing element, a driving clutch member connected to said driving means, a cooperating driven clutch member journalled by said bearing element free from driving impulses from said driving means when the clutch members are disconnected, a clutch shifting member extending through said bearing element, an operating member for said shifting member, a spring means operative in the clutching position of said operating member for biasing the shifting member to cause engagement between the clutch members, spring means operative in the clutch-release position of said operating member for overpowering said first spring means to disengage the clutch members, a latch arranged to hold said last mentioned spring means inoperative when desired, and means for tripping said latch to cause said second spring means to disconnect the driving clutch member from the driven clutch member upon the breaking of a thread.

6. In a multiple unit braiding machine, in combination, a horizontal main shaft, a plurality of braiding units each having a train of "horn" gears supported on a base plate, a bevel gear fixed to a gear of said train, an axially fixed clutch member having a bevel gear thereon for driving said bevel gear, an axially movable clutch member arranged to drive said clutch member or to permit it to stand, and a drive direct from said main

shaft to said movable clutch member arranged to turn the movable clutch member irrespective of its engagement with the other clutch member.

7. In a multiple unit braiding machine, in combination, a horizontal main shaft, a plurality of braiding units, driving means between said shaft and each of said units including a friction clutch having a driving member and a driven member, a fixed journal member on which said clutch members are journalled, means preventing substantial axial movement of said driven clutch member, said driving clutch member mounted for material movement axially of said driven member, a rod movably mounted with respect to said journal member, an engagement between one end of said rod and said driving clutch member whereby said rod moves said driving clutch member positively in both directions, a spring arranged at the other end of said rod for throwing said driving member into engagement with said driven member, a lever arranged to bear against said other end of the rod, a spring for moving said lever to throw said driving clutch member out of engagement with said driven clutch member, latch means for holding said lever in position to permit said clutch members to engage, means set into motion by the breaking of a yarn being braided for tripping said latch to permit said lever and second spring to disengage said clutch members, a base plate, a train of horn gears mounted on said base plate, a gear on said driven clutch member meshing with one of said horn gears, and a fulcrum for said lever connected to said base plate.

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