

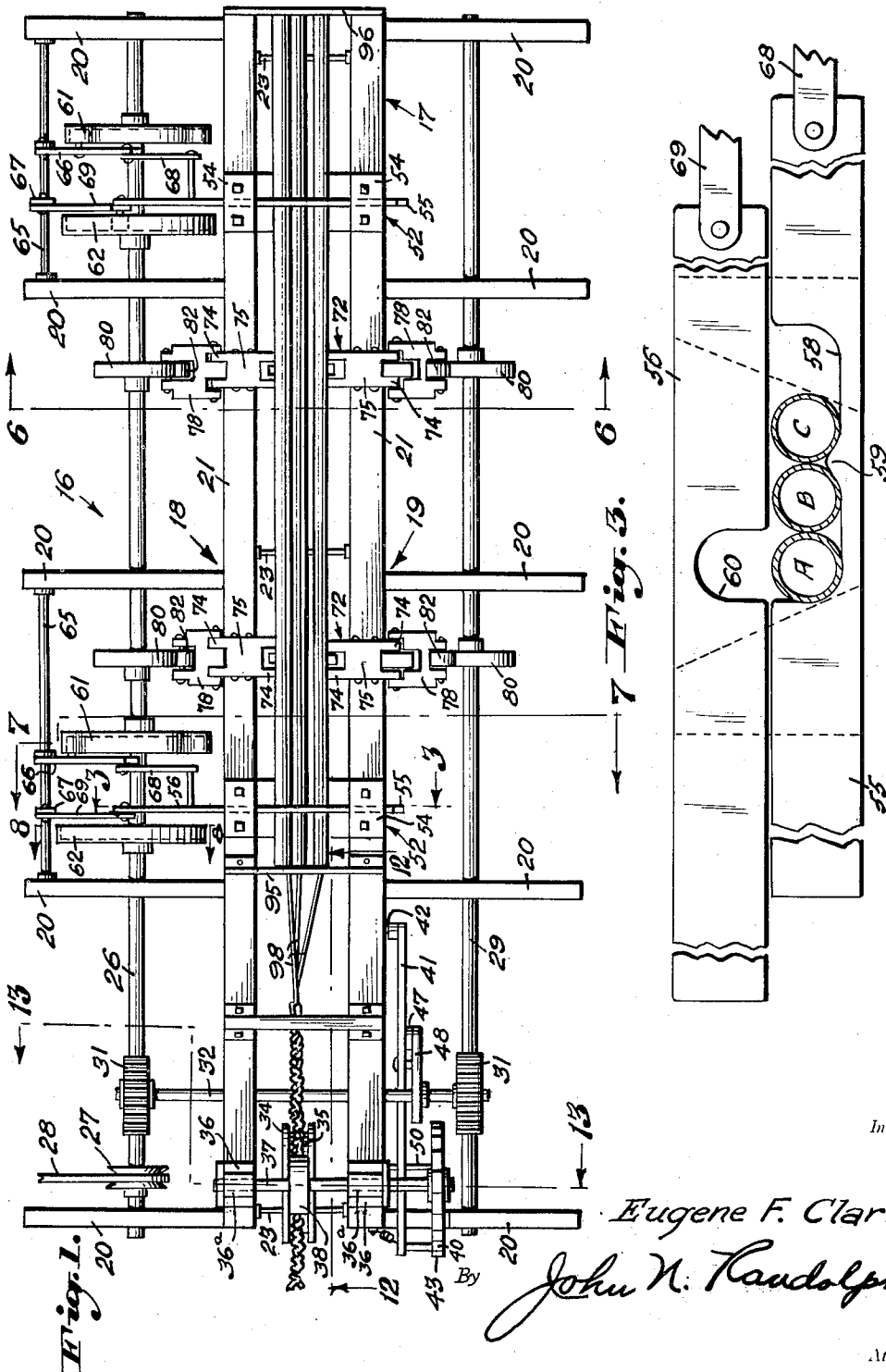
July 4, 1950

E. F. CLARK
BRAIDING MACHINE

2,513,451

Filed Jan. 14, 1949

4 Sheets-Sheet 1



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Fig. 2.

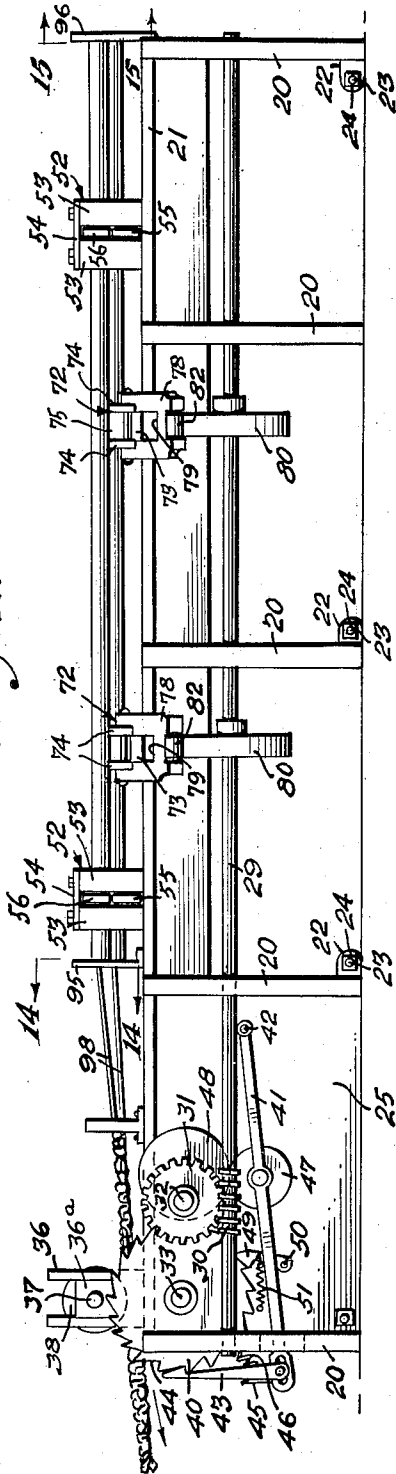


Fig. 4.

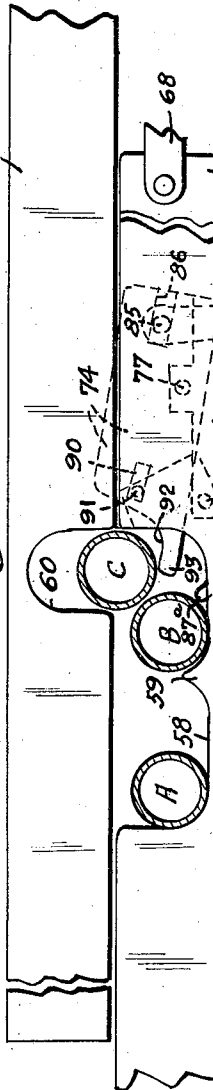
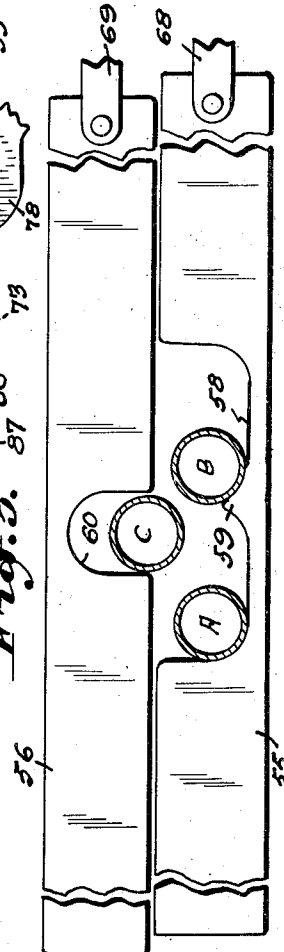


Fig. 5.



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Fig. 6.

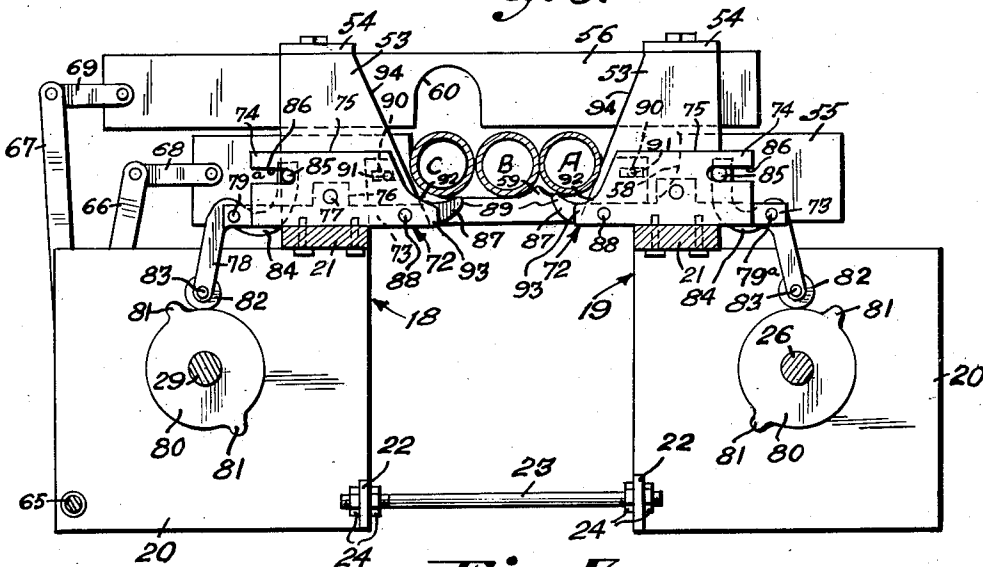


Fig. 7.

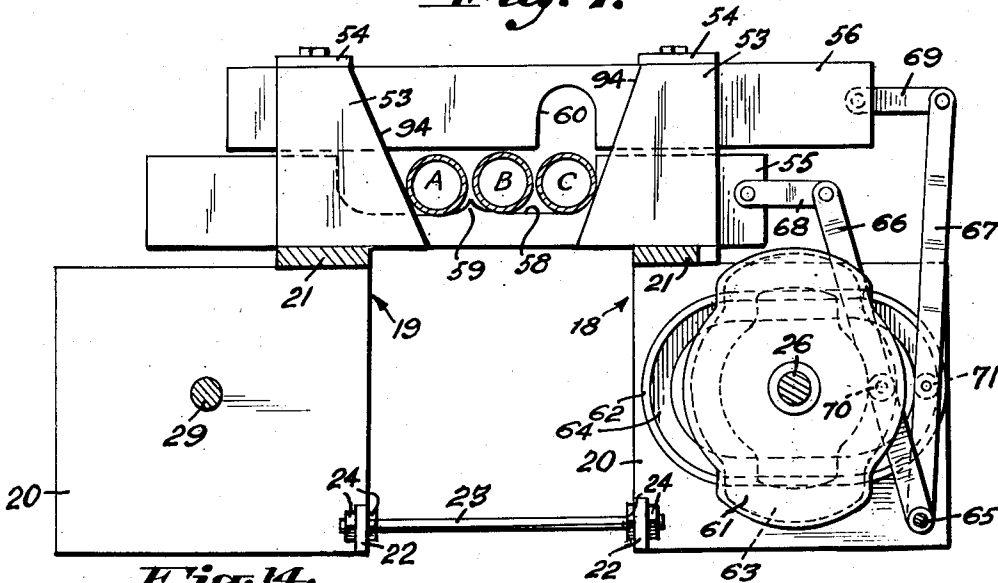
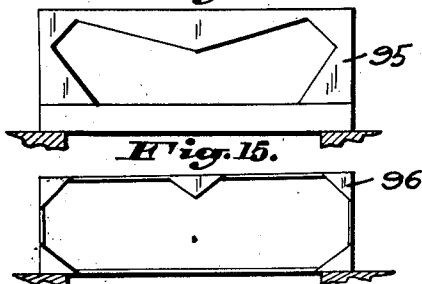


Fig. 14.



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Fig. 8.

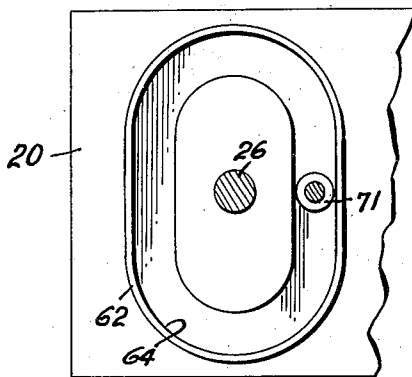


Fig. 9.

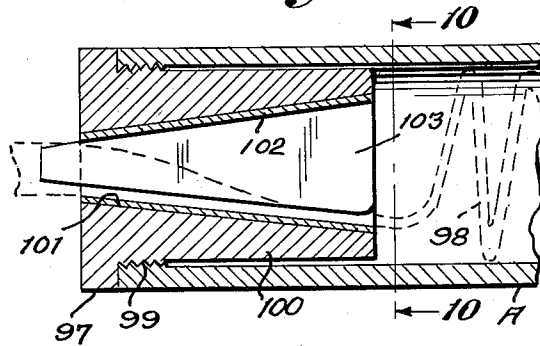


Fig. 10.

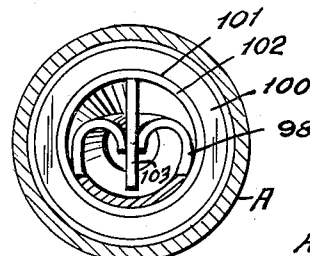


Fig. 11.

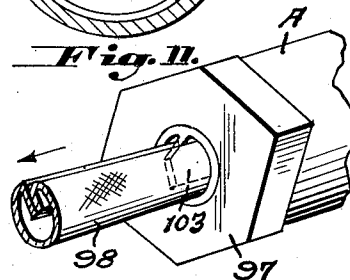


Fig. 12.

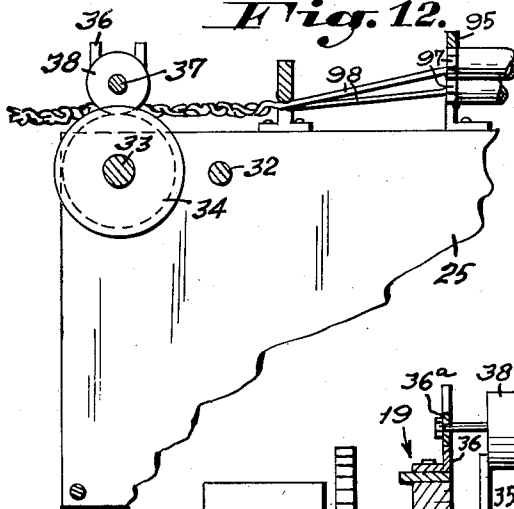
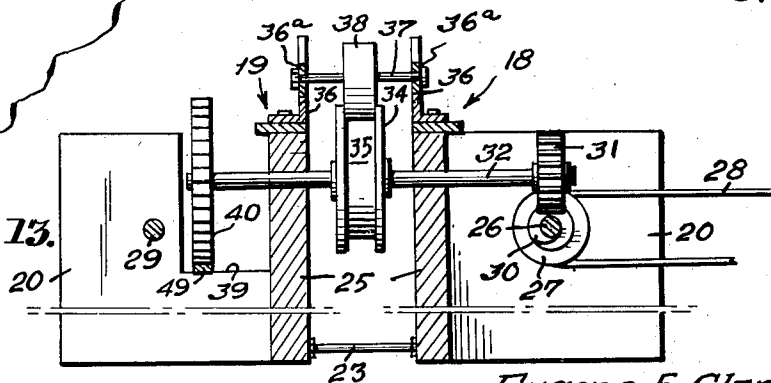


Fig. 13.



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UNITED STATES PATENT OFFICE

2,513,451

BRAIDING MACHINE

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Application January 14, 1949, Serial No. 70,891

11 Claims. (Cl. 87—33)

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This invention relates to a novel machine of extremely simple construction for use in braiding strips of cloth to form braids from which rugs or other articles may be manufactured.

More particularly, it is an aim of the present invention to provide a machine which may be constructed in various sizes for either home or commercial use and which utilizes tubes containing the cloth strips to be braided and which are carried back and forth and transversely of the machine and individually displaced vertically for crossing the tubes back and forth over one another so that the material which is withdrawn from corresponding ends of the tubes will be braided after leaving the tubes.

Another and important object of the invention is to provide a braiding machine having means contained in or adjacent the discharge ends of the tubes and extending therefrom for folding the strips of cloth as they are withdrawn from the tubes and for maintaining said strips folded until braided.

Still another object of the invention is to provide power driven means for actuating transversely reciprocating carriers having cam and pawl means for vertically displacing the cloth carrying tubes from lower to upper carriers whereby as the lower carriers are moved in each direction an outside tube will be elevated and dropped between the two remaining tubes.

A further object of the invention is to provide means actuated by the driving means of said carriers for revolving a friction means for withdrawing the braided strips from the machine and for exerting a pull on said strips to withdraw them from the tubes.

Still a further object of the invention is to provide a machine for accomplishing all of the aforementioned results which is of extremely simple construction and which may be economically manufactured and sold in various sizes for either home or commercial use.

Various other objects and advantages of the invention will hereinafter become more fully apparent from the following description of the drawings, illustrating a presently preferred embodiment thereof, and wherein:

Figure 1 is a top plan view of the machine;

Figure 2 is a side elevational view thereof looking from the bottom to the top of Figure 1;

Figure 3 is a fragmentary cross sectional view on an enlarged scale taken substantially along a plane as indicated by the line 3—3 of Figure 1 and showing one pair of the tube carriers;

Figure 4 is a fragmentary cross sectional view

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on an enlarged scale similar to Figure 3 but showing the carriers in another position of their movement and illustrating in dotted lines a portion of the actuating mechanism by means of which the tubes are moved into engagement with the upper carrier;

Figure 5 is a view similar to Figures 3 and 4 but showing another position of the carriers;

Figures 6 and 7 are enlarged cross sectional views taken substantially along planes as indicated by the lines 6—6 and 7—7, respectively, of Figure 1;

Figure 8 is an enlarged transverse vertical sectional view taken substantially along a plane as indicated by the line 8—8 of Figure 1;

Figure 9 is an enlarged longitudinal substantially central sectional view through the discharge end of one of the cloth carrying tubes;

Figure 10 is a cross sectional view of said tube taken substantially along a plane as indicated by the line 10—10 of Figure 9;

Figure 11 is a perspective view of said end of the tube;

Figure 12 is a fragmentary longitudinal sectional view taken substantially along a plane as indicated by the line 12—12 of Figure 1;

Figure 13 is a cross sectional view taken substantially along a plane as indicated by the line 13—13 of Figure 1; and

Figures 14 and 15 are enlarged cross sectional views taken substantially along planes as indicated by the lines 14—14 and 15—15, respectively, of Figure 2.

Referring more specifically to the drawings, the braiding machine in its entirety is designated generally 16 and includes a frame designated generally 17 composed of substantially identical frame sections 18 and 19 each of which includes a plurality of upright walls or plates 20 which are connected in longitudinally spaced relationship relatively to one another by a strip 21 which is secured to each of said plates in any suitable manner and which is disposed at the top and adjacent the inner edges thereof. Certain of the plates 20 are provided with apertured ears 22 and complementary ears 22 of the sections 18 and 19 are connected by spacing rods 23 having threaded ends each of which carries a pair of lock nuts 24 which engage opposite sides of the ears 22 for adjustably connecting the sections 18 and 19 in laterally spaced relationship relatively to one another. Between certain of the wall members 20, particularly and at least between the two forwardmost wall members or those located at the left-hand, front end of the machine 16 as illus-

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trated in Figures 1 and 2, are provided the longitudinal wall portions 25 in connection with each of the frame sections 18 and 19, as best illustrated in Figures 12 and 13 and for a purpose which will hereinafter become apparent.

The aligned wall members 20 of each of the frame sections are provided with aligned openings. The openings of the wall members 20 of the frame section 18 afford a journal for a shaft 26 which extends longitudinally through said frame section, as best illustrated in Figure 1 and which has a belt pulley 27 fixed thereto adjacent the forward end of the machine 16 and over which is trained an endless belt a portion of which is shown at 28 and which may be driven by any suitable motor or other power source for revolving the shaft 26 which forms the drive shaft of the machine 16. The shaft 26 is revolved in a clockwise direction as seen in Figure 13. Another shaft 29 extends longitudinally of and is similarly journaled by the walls 20 of the section 19. The shafts 26 and 29 are provided with worms 30 which mesh with worm gears 31 which are fixed to the ends of a countershaft 32 journal in the frame section walls 25, as best illustrated in Figures 1 and 13, for driving the shaft 29 from the shaft 26 and in the opposite direction.

As best seen in Figure 13, a shaft 33 is journaled in the wall members 25 adjacent the forward end of the machine 15 and forwardly of the countershaft 32 and has a wheel 34 fixed to the intermediate portion thereof and which is provided with a circumferentially extending groove 35 in its periphery. A pair of vertically slotted journal members 36 are secured to and extend upwardly from the frame sections 18 and 19 directly above the shaft 33 to provide a journal for the ends of a shaft 37 which is mounted therein for vertical reciprocating movement. A roller 38 is fixed to the shaft 37 and is of a width to fit into the wheel groove 35 and normally rests on the upper portion of the bed thereof. The ends of shaft 37 are journaled in journal blocks 36a which are mounted for vertical sliding movement in the slotted uprights 36. It will be readily apparent that the weight of the roller 38 and shaft 37 will retain the peripheral portion of the roller in engagement with the wheel groove 35, for a purpose which will hereinafter become apparent. The forwardmost wall member 20 of the frame section 19 has a recess 39 for accommodating a ratchet wheel 40 which is fixed to one end of the shaft 33.

As best seen in Figures 1 and 2, a lever 41 is pivotally mounted at 42 at one end thereof on the outer side of the wall 25 of the frame section 19 and said lever extends forwardly therefrom through the recess 39 and has a pawl 43 pivotally connected to its forward end and extending upwardly therefrom and which is adapted to engage the radial faces 44 of the teeth of the ratchet wheel 40 for turning said ratchet wheel and the shaft 33 in a counterclockwise direction as seen in Figure 2 when the lever 41 is swung downwardly. A leaf spring 45 which is fixed to the lever 41 and bears against the pawl 43 urges said pawl into engagement with the teeth 44 and permits the pawl to ride over the rounded sides of the teeth 44 when the lever 41 is swung upwardly so that the pawl 43 will actuate the ratchet wheel 40 and shaft 33 in a step-by-step movement and in a counterclockwise direction, as seen in Figure 2. A contractile spring 46 which is connected to the outer end of the lever 41 and to a portion of the frame section 19

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urges said lever upwardly. A roller 47 is journaled on one side of the lever 41, intermediate of the ends of said lever for engaging under a disk 48 which is eccentrically fixed to the shaft 32 to form a cam for swinging the lever 41 downwardly at each revolution of the shaft 32 so that the shaft 33 and friction wheel 34 will be turned a distance equal to the space between two adjacent teeth 44 each time that the shaft 32 makes a revolution. A pawl 49 is journaled on a pin 50 which projects outwardly from the wall 25 of the section 19 and extends upwardly therefrom for engaging the ratchet teeth 44 to prevent the ratchet wheel 40 from turning clockwise as seen in Figure 2 when the pawl 43 is moving upwardly and riding over the teeth 44. A contractile spring 51 which is anchored to said wall 25 yieldably retains the pawl 49 in engagement with the teeth 44.

As best illustrated in Figures 1 and 2, the machine 16 is provided with two longitudinally spaced transversely extending tube carrier units of identical construction and each of which is designated generally 52. Each unit 52 includes pairs of transversely aligned upright guide members 53 which are supported on the top portion of the frame sections 18 and 19 and which are provided with detachable crossheads 54 at the tops thereof. The pairs of uprights 53 provide guides for a lower tube carrier bar 55 and an upper tube carrier bar 56 which is disposed above its complementary bar 55 and which bars are mounted for transverse sliding movement in the guides 53 and relatively to the machine frame 17. As best seen in Figures 6 and 7, the tube carrying bars 55 and 56 are disposed with their planes in vertical positions so that the lower edge of the upper bar 56 rests on the upper edge of the bar 55 or is disposed just above and adjacent thereto. The lower bar 55 is provided with an elongated recess 58 which opens upwardly and which is provided intermediate of its ends with an upwardly tapering projection 59. The recess 58 is adapted to support portions of three cloth carrying tubes designated generally A, B and C. The tubes A, B and C extend longitudinally of the machine 15 and transversely through the recess 58 and as clearly illustrated in Figures 3 and 7, the portion of the recess 58 on each side of the projection 59 is of a sufficient length to accommodate two of the tubes, for a purpose which will hereinafter become apparent. The upper bar 56 is provided with a downwardly opening notch or recess 60 of a size to receive and accommodate only one of the tubes A, B or C.

The shaft 26 is provided with a pair of shell cams 61 and 62, as best seen in Figure 1, which form a part of each tube carrier unit 52. The shell cam 61 is provided with a generally oval-shaped endless recess or groove 63 which opens outwardly of one side thereof and as indicated in dotted lines in Figure 7 and the shell cam 62 is provided with an endless oval-shaped recess 64 which opens outwardly of the opposite side thereof and in a direction toward the open side of the groove 63. As seen in Figures 1 and 6, a shaft 65 extends between two of the wall members 20 of the frame section 18 and has two levers 66 and 67 swingably mounted at their lower ends thereon. The shorter of these levers, namely the lever 66, is connected at its upper end by a link 68 to the adjacent end of the lower carrier bar 55 and the upper end of the longer lever 67 is similarly connected by a link 69 to the corresponding end of the upper carrier bar 56. The

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lever 66 has a roller 70 journaled on one side thereof and which runs in the groove or cam way 63 and, as seen in Figure 8, the lever 67 has a roller 71 journaled on one side thereof and which runs in the groove or cam way 64 of the shell cam 62. The parts previously described constitute one of the carrier units 52 and which support the tubes A, B and C adjacent the corresponding ends thereof and, as seen in Figure 1, an identical tube carrying unit 52 is mounted on the machine 16 for supporting the fabric containing tubes adjacent their opposite ends.

The machine 16 is also provided with two sets or pairs of tube shifting units each designated generally 72 and which are disposed in longitudinally spaced relationship to one another and between the tube carrying units 52. Each of the tube shifting units 72 is composed of a pair of corresponding sections which are mounted in opposed relationship laterally spaced relatively to the machine frame 17 and one on each of the frame sections 18 and 19. As best seen in Figures 1, 2 and 6, each tube shifting unit section 72 includes an elongated bar 73 which is fixedly supported on one of the strips 21 and extends transversely thereof. A pair of plates 74 straddle the bar 73 and are integrally connected along their upper edges by a top wall portion 75. The bar 73 has an upwardly projecting intermediate portion 76 for receiving a pin 77 which extends therethrough and through the plates 74 for pivotally mounting said plates for vertical rocking movement on the bar 73. A relatively wide lever 78 has a slotted intermediate portion 79 through which the outer end of the bar 73 extends, as seen in Figure 2, and as seen in Figure 6, a pin extends through said outer end of the bar 73 and transversely through the lever 78 to form a pivot 79a on which the lever 78 is mounted to rock relatively to the bar 73. The shafts 26 and 29 each have two disks 80 fixed thereto. The disks 80 are each provided with two diametrically opposed projections 81 which extend from the peripheries thereof and which are provided with rounded circumferentially spaced sides. One of the disks 80 functions with each of the four sections of the tube shifting units 72. The lower end of each lever 78 is bifurcated to receive a roller 82 which is journaled therein on a pin 83 and which rides on the periphery of one of the disks 80. Since the shaft 26 and the disks 80 carried thereby are turning in a clockwise direction as seen in Figure 6 the rollers of the levers 73 which are actuated by the disks 80 of the shaft 26 will be rocked by the projections 81 in a counterclockwise direction, as seen in Figure 6, and as the shaft 29 is revolving counterclockwise the rollers 82 of the levers 78 which engage the disks 80 thereof will be rocked in a clockwise direction so that the upper, inner portions of said levers will swing inwardly and downwardly relatively to the frame 17. Each of the levers 78 is provided with a bifurcated upper end 84, the furcations of which straddle the pair of plates 74 of the tube actuating section with which said lever is associated and said furcations 84 have a pin 85 extending between the free ends thereof and through aligned outwardly opening slots 86 in the plates 74. A pawl 87 is pivotally mounted by a pin 88 on the inner portion of each bar 73 and has an inwardly and upwardly extending hook-shaped portion 89, for a purpose which will hereinafter become apparent and which normally extends into the space beneath and between two of the tubes designated A, B or C. The upper

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portion of each pawl 89 is provided with a slot 90 to receive a pin 91 which extends transversely between the plates 74. Said plates 74 at their inner ends are provided with downwardly inclined concave surfaces 92 for a purpose which will hereinafter become apparent.

The shell cams 61 and 62 are disposed at 90° angles to one another so that the tube carrier bars 55 and 56 will reciprocate simultaneously in opposite directions. As the bars 55 and 56 approach their positions as illustrated in Figure 7 the tube shifting units or sections 72 which are supported on the frame section 19 will be actuated by the disks 80 of the shaft 26 for rocking the levers 78 thereof counterclockwise as seen in Figure 6 to cause the pins 85 of said levers to exert a downward pressure on the plates 74 to cause said plates to rock as a unit to their dotted line positions of Figure 4 so that the right-hand tube C will be engaged by the extensions 93 of the plates 74 which are swung upwardly for forcing said tube C upwardly into the notch 60 of the upper carrier bar 56 of each carrier unit. This will occur as the bars 55 are moving from left to right and the bars 56 from left to right of Figure 4 and thereafter the tube B will move into contact with the inner edges 94 of the guide members 54 and will be prevented thereby from moving to the right-hand end of the recess 58, as seen in Figure 4. As the notch 60 passes over the tube B, the tube C will drop due to its weight between the tubes A and B and as the left-hand end of the notch 58, as seen in Figure 4, is exposed beyond the inner edges 94 of the guide members 53 on the opposite side of the machine, said tube A slides from right to left in Figure 4 to permit the tube C to enter the recess 58 directly to the left of the projection 59. As the plates 74 are rocked as seen in Figure 4, the pawl 87 connected thereto will be rocked to cause its upturned free end 87a to swing downwardly so that the tube B can pass thereover. Thereafter end 87a will return to its normal position of Figure 6 to retain the tube B at the right-hand end (Figure 4) of recess 58 to provide a space between the tube B and projection 59 for thereafter receiving the tube A, as will hereinafter be described. As the bottom carrier bar 55 thereafter moves to the left and as the top carrier bar 56 moves to the right of Figure 4, the tube actuating units or sections 72 on the other side of the machine will engage and elevate the tube A in the same manner as previously described into the notch 60 and so that said tube A will thereafter be dropped between the tubes C and B and to the right of the projection 59. It will therefore be readily apparent that this operation will continue for crossing the tubes back and forth one over the other in the same manner that three strips of material are braided by hand.

The machine 16 is provided with a recessed plate 95 at its forward end for receiving the forward ends of the tubes A, B and C and a recessed plate 96 at its rear end for receiving the rear ends of said tubes. Said front and rear tube ends are provided with hexagon-shaped portions 97 for fitting into the recesses of the plates 95 and 96, the shapes of which recesses are best illustrated in Figures 14 and 15, respectively. The recesses of the plates 95 and 96 are shaped to permit the hexagon-shaped ends 97 of the tubes to slide laterally and vertically of the machine frame 17 but the flat surfaces defining said recesses prevent the tubes from revolving relatively to the carrier bars 55 and 56 due to

engagement of the lands of the portions 57 therewith.

Each of the tubes A, B and C is adapted to contain a long strip of fabric 98 which may be disposed therein in a lapped or folded condition, as illustrated in Figure 9, which fabric strips 98 are not illustrated in Figures 3 to 7. Each of the tubes A, B and C is provided with an internally threaded open end 99 for receiving the threaded portion of a plug 100 which is removably mounted therein. The outer end of each plug 100 has a hexagon-shaped portion disposed beyond the open end of its tube A, B or C and which forms the hexagon-shaped forward end portion of said tube for engagement in the recess of the plate 95. Each plug 100 is relatively long and is provided with a frusto-conical outwardly tapered bore 101 containing a similarly shaped lining 102 which is provided with a longitudinally extending web or flange 103 the outer restricted end of which projects outwardly from the outer end of the plug 100 and the longitudinal free edge of which is spaced from and disposed relatively near a portion of the conical wall of the lining 102, as best illustrated in Figure 9. The lapped strip of fabric 98 is withdrawn through the bore of the lining 101 and in passing outwardly therethrough the longitudinal side edge portions of the fabric 98 which extend upwardly are curled inwardly by the taper of said lining 101 and engage and are curled downwardly by the flange 103 so that the fabric strip 98 is discharged from its tube A, B or C folded into four plies as illustrated in Figure 11 and passes therefrom longitudinally and forwardly of the machine 16 and beneath a guide bar 104 which extends across the upper edges of the walls 25 and thence through the groove 35 of the wheel 34 and between said wheel and the upper traction wheel 38.

From the preceding description it will be readily apparent that the wheel 34 is driven in a counterclockwise direction as seen in Figure 12 by the pawl 43 and ratchet 40, as previously described, and the weight of the wheel 38 on the fabric strips 98 will cause said strips to be drawn out of the tubes A, B and C and forwardly through the machine past the wheels 34 and 38. This movement of the wheel 34 will be a slow step-by-step movement and as it is occurring, as previously described, the tubes A, B and C will be actuated for movement back and forth across one another so that the strips of fabric 98 after passing from said tubes will be braided between the time that they leave the tubes and engage the wheels 34 and 38 so that the fabric strips 98 will pass forwardly from the machine in the form of a braid 105.

It will thus be readily apparent that the machine 16 will effectively function to fold and braid three strips of fabric of any desired length. Obviously, the machine 16 may be made in various lengths for accommodating the tubes A, B and C of various lengths and may be driven at different speeds by any suitable variable speed motor or power source which drives the belt 28.

After the strips 98 have been completely paid out from the tubes, the crossheads 54 may be removed so that the upper carrier bars 56 may be swung upwardly to remove the tubes and so that other tubes filled with fabric strips 98 may be placed in the machine to replace the empty tubes. For this purpose one or the other of the plates 95 or 96 is also removed.

Various modifications and changes are con-

templated and may obviously be resorted to, without departing from the spirit or scope of the invention as hereinafter defined by the appended claims.

I claim as my invention:

1. A braiding machine comprising an elongated frame having one end constituting the front or discharge end of the machine, laterally spaced longitudinally extending shafts journaled in the machine frame, one of said shafts constituting a driven shaft, countershaft means for driving the other shaft from the driven shaft for causing the shafts to be revolved in opposite directions, a shaft journaled transverse to the machine adjacent its forward end, a wheel fixed to said last mentioned shaft and provided with a circumferentially grooved periphery, pawl and ratchet means for revolving said last mentioned shaft and wheel and actuated by said countershaft means, a traction wheel disposed above said grooved wheel and engaging in the groove thereof, means for journaling and supporting said traction wheel for vertical sliding movement above the grooved wheel, three cloth strip carrying tubes disposed in said machine and longitudinally thereof, a carrier unit for supporting said tubes in the machine, cam means actuated by the rotation of one of said first mentioned shafts for reciprocating the carrier unit transversely of the machine, a pair of tube actuating sections forming an actuating unit supported on said machine and with said sections disposed in laterally spaced relationship, cam means actuated by said first mentioned shafts for rocking said tube actuating sections in vertical planes as said carrier means is reciprocated for alternately lifting the tube located adjacent one longitudinal side of the machine for causing said tube to be deposited between the two remaining tubes, said actuating unit section at each side of the machine being timed to operate as the carrier unit moves toward said side of the machine frame for elevating and displacing the tube located nearest said side of the machine into a position between the other two tubes, and the fabric strips contained within said tubes being withdrawn from corresponding ends thereof by engagement of said strips with said grooved wheel and traction wheel whereby the strips will be withdrawn from the tubes and braided by the movement of the tubes back and forth across one another as the strips are being extracted therefrom.

2. A machine as in claim 1, said grooved wheel and traction wheel being spaced a sufficient distance from the discharge ends of the tubes to permit the strips of fabric to be braided by the tubes after leaving the discharge ends thereof, and a guide member disposed between said wheels and the tubes and beneath which the strips are drawn and guided into engagement with said wheels.

3. A machine as in claim 1, the pawl of said pawl and ratchet means being reciprocated relatively to the ratchet to cause said grooved wheel to be revolved in one direction only and in a step-by-step movement.

4. A machine as in claim 1, a second carrier unit for supporting said tubes disposed in longitudinally spaced relationship to the first mentioned carrier unit, and a second tube actuating unit composed of laterally spaced tube actuating sections mounted on the machine in longitudinally spaced relationship to the first mentioned tube actuating unit.

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5. A machine as in claim 1, a second carrier unit for supporting said tubes disposed in longitudinally spaced relationship to the first mentioned carrier unit, and a second tube actuating unit composed of laterally spaced tube actuating sections mounted on the machine in longitudinally spaced relationship to the first mentioned tube actuating unit, each of said carrier units being actuated by said driven shaft and simultaneously in uniformity with the other carrier unit.

6. A machine as in claim 1, a second carrier unit for supporting said tubes disposed in longitudinally spaced relationship to the first mentioned carrier unit, and a second tube actuating unit composed of laterally spaced tube actuating sections mounted on the machine in longitudinally spaced relationship to the first mentioned tube actuating unit, the tube actuator sections of the tube actuating units being actuated by the first mentioned longitudinally extending shafts and the actuating sections disposed at each side of the machine being simultaneously actuated for simultaneously engaging longitudinally spaced portions of one of the tubes.

7. A machine as in claim 1, and guide means for engaging the ends of said tubes for preventing the tubes from rotating in the machine as said tubes are displaced back and forth across one another.

8. A machine as in claim 1, said carrier unit including a lower and an upper carrier bar, said bars being reciprocated transversely of the machine and simultaneously in opposite directions, said lower carrier bar having an upwardly opening recess sized to accommodate four of said tubes and in which the three tubes are supported, said upper carrier bar having a downwardly

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opening recess sized to receive one of the tubes and into which one of said tubes is elevated by one of the tube actuating sections as the tubes approach each side of the machine for being carried by said upper bar into a position to be discharged between the two remaining tubes supported in the recess of the lower carrier bar.

9. A machine as in claim 1, each of said tube actuating sections including a member disposed transverse to the machine and mounted to be rocked vertically by the cam means thereof for elevating the inner end thereof to cause said inner end to engage under and elevate the tube located adjacent thereto.

10. A machine as in claim 1, each of said tubes being provided with an open discharge end, a removable plug for closing said discharge end having a longitudinal bore extending therethrough and tapered toward its outer end and through which the fabric strip is withdrawn from the tube, said tapered bore functioning to fold the fabric strip as it is withdrawn therethrough.

11. A machine as in claim 1, each of said tubes being provided with an open discharge end, a removable plug for closing said discharge end having a longitudinal bore extending therethrough and tapered toward its outer end and through which the fabric strip is withdrawn from the tube, said tapered bore functioning to fold the fabric strip as it is withdrawn therethrough, and a flange extending longitudinally of said bore for turning the folded longitudinal edges of the strip inwardly and back upon themselves.

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No references cited.