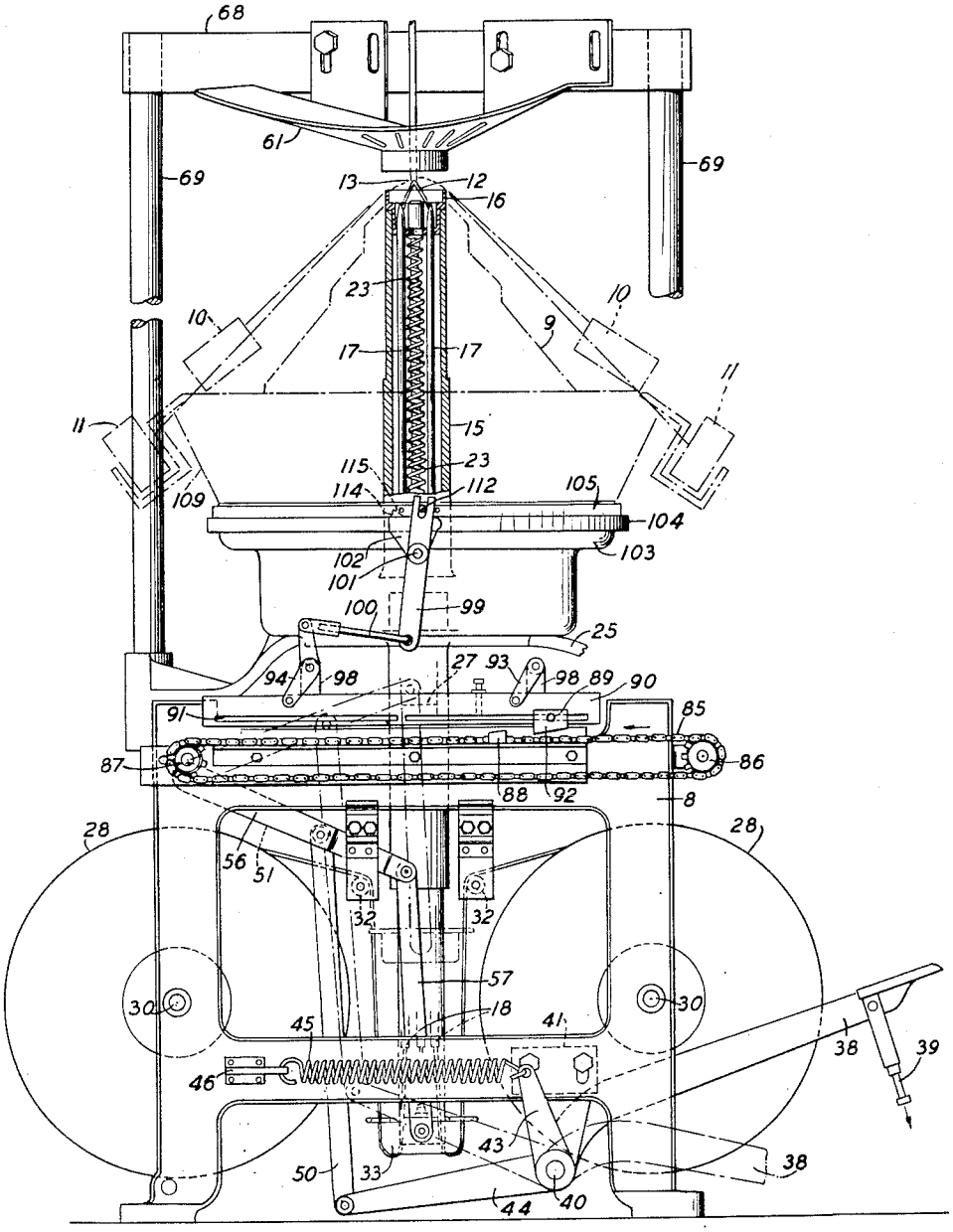
Dec. 3, 1940. B. K. FORD 2,223,954

METHOD OF AND APPARATUS FOR ASSEMBLING STRANDS

Filed June 28, 1938 4 Sheets-Sheet 1

FIG. 1



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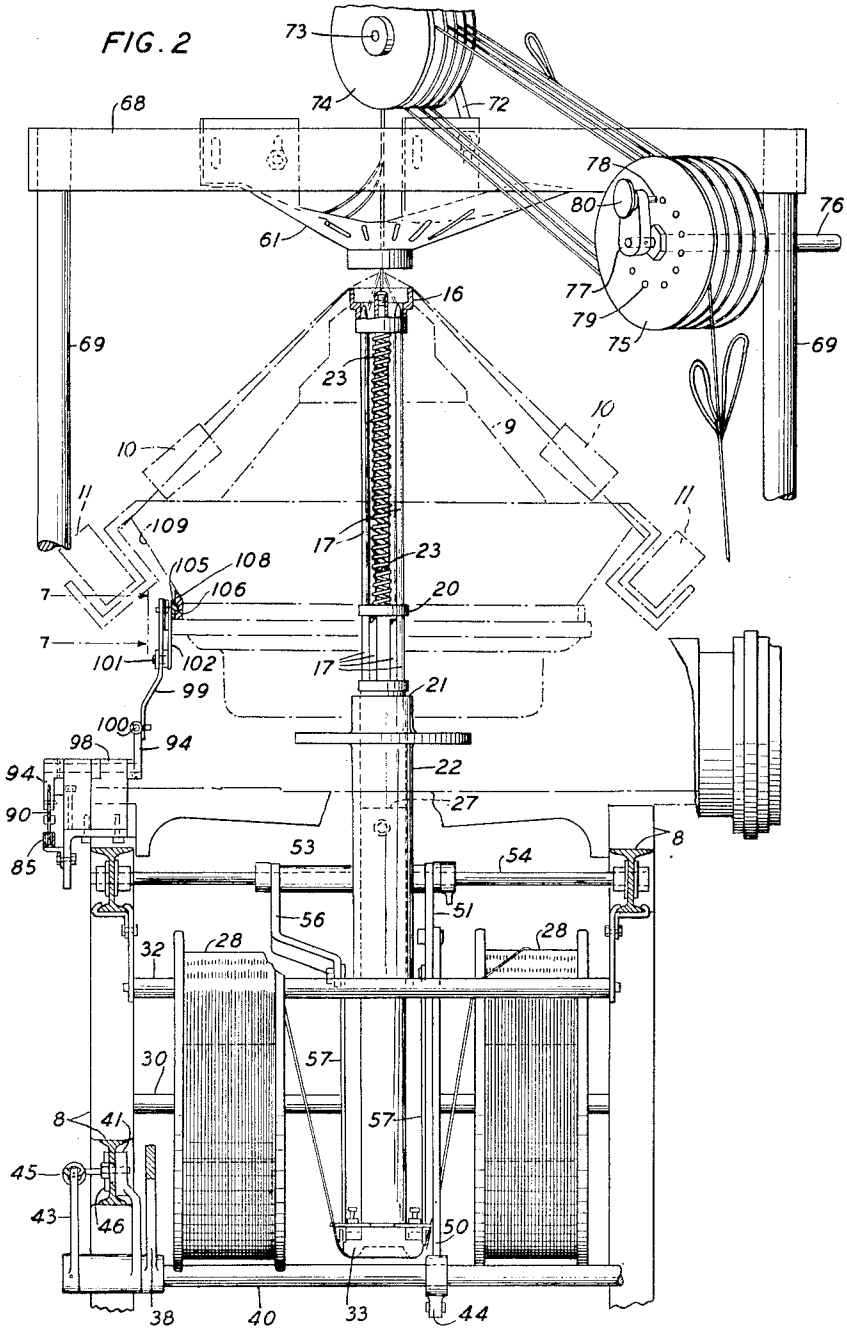
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METHOD OF AND APPARATUS FOR ASSEMBLING STRANDS

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FIG. 2



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METHOD OF AND APPARATUS FOR ASSEMBLING STRANDS

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FIG. 3

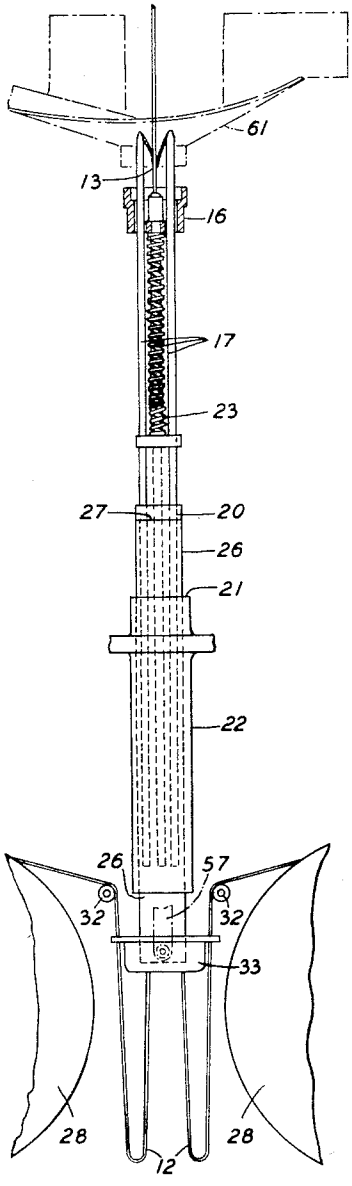


FIG. 9

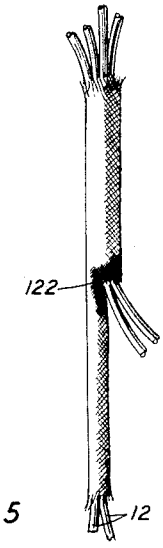


FIG. 10

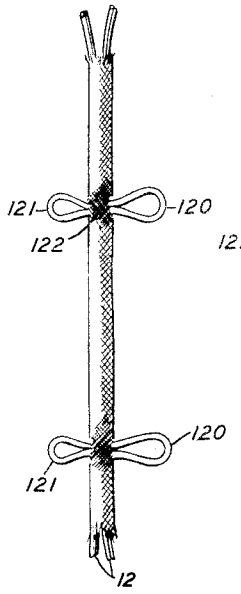


FIG. 11

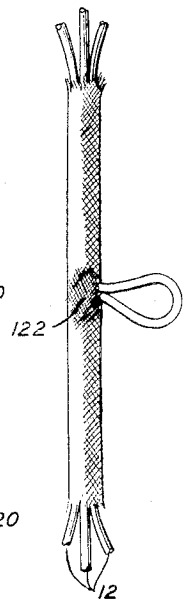


FIG. 5

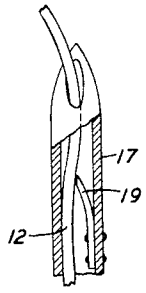
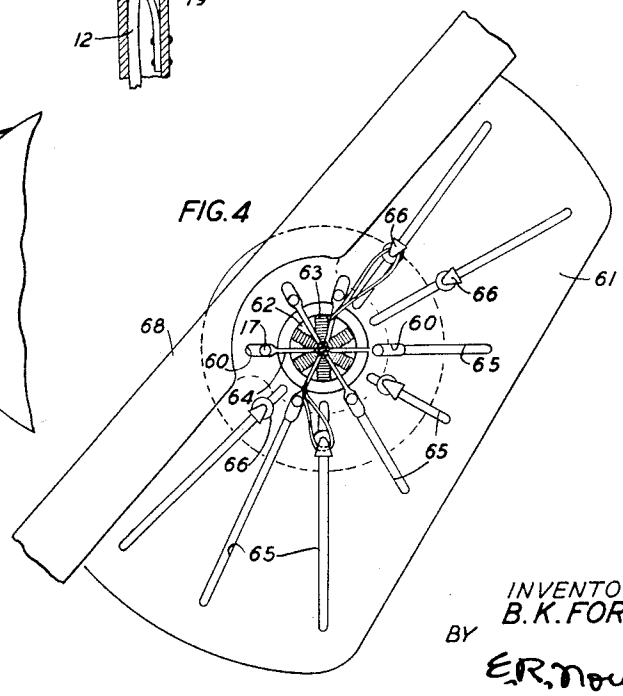


FIG. 4



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METHOD OF AND APPARATUS FOR ASSEMBLING STRANDS

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FIG. 6

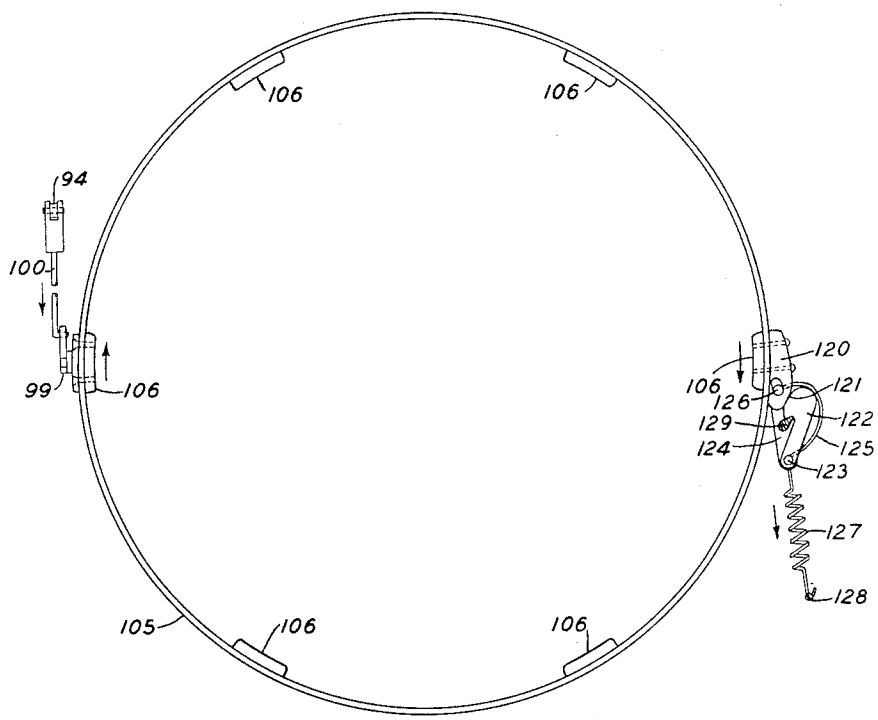


FIG. 7

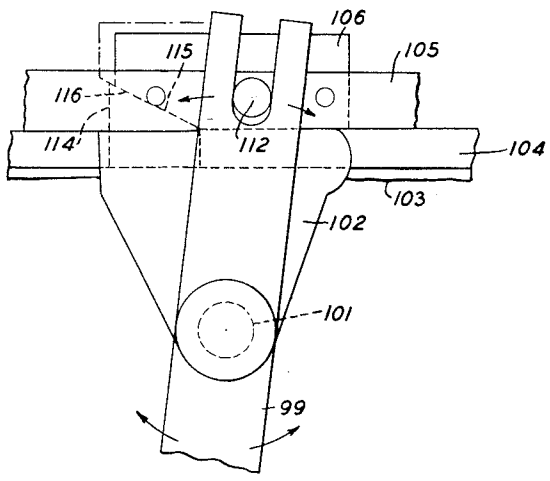
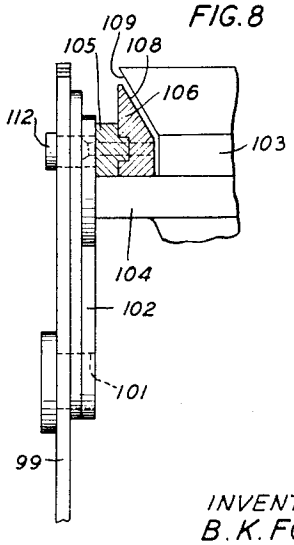


FIG. 8



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Patented Dec. 3, 1940 2,223,954

UNITED STATES PATENT OFFICE

2,223,954

METHOD OF AND APPARATUS FOR ASSEMBLING STRANDS

Ben K. Ford, Westfield, N. J., assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York

Application June 28, 1938, Serial No. 216,251

25 Claims. (Cl. 96—3)

This invention relates to a method of and apparatus for assembling strands and more particularly to a semi-automatic apparatus by means of which the method may be practised for producing multi-conductor cords and the like.

In the electrical art, especially in telephone systems, it is desirable to employ multi-conductor cords for electrically connecting cooperating devices of the system. The Patent 1,954,979 of April 17, 1934, to William T. Barrans and Ben K. Ford illustrates an apparatus for automatically assembling one form of the multi-conductor cords.

An object of the invention is to provide a simple, efficient and practical method of and apparatus for producing various types of strand assemblies.

With this and other objects in view the invention comprises an apparatus by means of which a method may be practised for braiding a cover on strands to form cords wherein a timing mechanism automatically stops the braiding unit at selective intervals during which the operator may move the tubular guides for the strands beyond the braiding point to produce slack in each strand so that portions of predetermined length of the strand may be secured to a gage member and the selective number of strands to be covered may be increased or decreased at will. Also, means is provided to cause the braiding unit to apply a closer braid at the beginning of each cord.

Other objects and advantages will be apparent from the following detailed description when taken in conjunction with the accompanying drawings, in which

Fig. 1 is a side elevational view of the apparatus, portions thereof being shown in section;

Fig. 2 is a front elevational view of the apparatus, portions thereof being broken away to illustrate the invention;

Fig. 3 is a fragmentary view of a portion of the strand controlling means shown in its raised position;

Fig. 4 is a top plan view of the gage plate and associated parts;

Fig. 5 is a fragmentary view of one of the strand controlling elements, a portion thereof being shown in section;

Fig. 6 is a top plan view of the brake mechanism;

Fig. 7 is an enlarged fragmentary side elevational view taken along the line 7—7 of Fig. 2;

Fig. 8 is a fragmentary side elevational view of the structure shown in Fig. 7, and

Figs. 9, 10 and 11 are views illustrating some of the various types of cords which may be produced from the apparatus.

Referring now to the drawings, wherein like reference numerals designate similar parts throughout the views, numeral 8 designates a supporting table upon which is mounted a braiding unit 9. Although the braiding unit is a part of this invention it is not believed necessary to show it in detail in order to illustrate the invention. The braiding unit may be of any well known type comprising the usual rotatable carriers for respectively carrying the inner and outer sets 10 and 11 of bobbins or cops to form a covering on strands 12 at the point 13, which hereinafter may be described as the braiding point. A stationary tube 15 extends upwardly through the braiding unit for rotatably supporting the latter and has a head portion 16 removably secured to the upper end of the sleeve and has apertures in spaced circular formation to guide strand controlling elements 17. The elements 17 are relatively long, extending from points 18 shown near the bottom of Figs. 1 and 3 to positions near the braiding point 13 and are axially bored to allow the strands 12 to pass upwardly therein to and through apertures near their upper ends, the strands being held against downward movement by resilient members 19 (Fig. 5). The elements 17 are rigidly held in radially spaced positions by a retaining member 20 normally held in engagement with the upper edge 21 of a tubular guide 22 by means of a helical compression spring 23, the upper end of which engages the lower or inner portion of the head 16. The tubular guide 22 has an integral annular flange fixed to and rigidly held by a bracket 25 mounted upon the table 8. Slidably disposed in the guide 22 is a tubular actuating or lifting member 26 normally positioned with its upper edge 27 spaced a desired distance beneath the upper edge 21 of the guide, the purpose of which is to allow sufficient movement of the actuating member before it is moved into engagement with the retaining member 20 to allow a sufficient slack in each strand before moving the elements 17 upwardly.

Any desired number of strand controllinng elements may be employed, in the present instance there being six shown (Fig. 4), and for each element there is provided a reel of strand material, these reels, indicated at 28, being positioned in groups of three rotatably supported by shafts 30 removably supported by the table 8 (Figs. 1 and 2). A pair of sleeves 32, positioned in parallel relation and rotatably mounted upon rods having their ends fixed to brackets mounted upon the

table, serves as guides for the strands being drawn from the reels (Figs. 1 and 3). The strands pass downwardly from the sleeves 32 to the lower end of the actuating member 26. To the lower end of the member 26 is removably secured an annular guide member 33 having rounded lower edges to guide the strand material as it is drawn upwardly to and through the strand controlling elements 17.

A mechanism is provided to move the actuating member 26 upwardly when the braiding unit is stopped. This means comprises a treadle 38 having an adjustable stop 39 to limit its downward movement, the treadle being fixed to a shaft 40 journalled in brackets 41 secured to the table 8. Movement of the treadle downwardly to the dotted line position (Fig. 1) causes a rocking of the shaft 40 clockwise and a similar movement of a spring arm 43 and a lifting arm 44, which are also fixed to the shaft 40. The spring arm 43 has its upper end connected to one end of a helical tension spring 45, the other end of the spring being secured to a fixed bracket 46 mounted on the table. The purpose of the spring 45 is to rock the shaft 40 counter-clockwise to return the actuating mechanism to its normal position when the foot treadle 38 is released. Pivoted to the outer end of the lifting arm 44 is a link 50 connecting the arm operatively to a lever 51 between the ends of the latter. One end of the lever 51 is fixed to a hollow shaft 53 rotably mounted upon a solid shaft 54 which extends from one side of the table to the other where its ends are rigidly secured thereto, as illustrated in Fig. 2. A similar lever 56 is also secured to the hollow shaft 53 at one end thereof and, in its normal position, extends inwardly and downwardly in a direction parallel to the lever 51 (Figs. 1 and 2). Pivoted to the inner ends of the levers 51 and 56 are links 57 which extend downwardly therefrom and have their lower ends pivotally secured to guide member 33. In this manner the actuating member 26 is operatively connected to the treadle 38 to be moved upwardly when the treadle 38 is moved downwardly. The purpose of this movement of the actuating member 26 is to move the controlling elements 17 above the braiding point 13 so that the operator may, when the braiding unit is idle, form loops in certain of the strands 12 being covered so that uncovered portions will be present at the end of each cord section.

When the controlling elements 17 are moved upwardly through the actuation of the treadle 38 their upper ends pass through apertures 60 in a gage unit 61 (Figs. 3 and 4) so as to position the strands projecting from the elements thereabove. By viewing Fig. 4 it will be observed that the unit 61 has a relatively large aperture 62 concentric with the advancing cord and provided with a plurality of radially extending spring compressed plungers 63 having concave inner ends conforming to the cord as it leaves the braiding point to serve as guides for the cord. Slots 64 extending from the apertures 60 to the aperture 62 provide passageways for the strands 12 as they are moved upwardly during upward movement of the elements 17. A plurality of slots 65 extending radially for desired distances from points near the aperture 62 adjustably receive retaining elements 66, which in the present instance are in the form of resilient hook members, around which the strands 12 may be looped or bent. The retaining elements 66 may be formed with collars larger in diameter than the cross sectional dimensions of the slots 65 and may be adjustably secured in place by nuts disposed upon threaded portions extending through the slots. If desired, more than one retaining member may be disposed in the slots and their positions may be varied to provide a multiplicity of selective retaining members for the temporary fastening of loops or free ends of the strands of any desired measured length. The gage unit 61 has upwardly projecting integral portions by the aid of which the unit may be secured to a cross bar or member 68, the ends of the latter being supported by upright bars 69, the lower ends of which are rigidly mounted in brackets upon the table 8.

The cross bar 68 has also fixed thereto a bracket 72 for supporting a shaft 73 for a plurality of idler pulleys 74. The finished cords or strand assemblies which are held together by the braiding material are directed upwardly about one of the pulleys 74 around which it passes to a groove of a capstan 75, the latter being rotatably mounted upon a shaft 76, suitably supported by the cross bar 68 and driven from a constant speed means (not shown). The inner end of the shaft 76 has fixed thereto an arm 77 carrying in its outer end a pin 78 normally urged inwardly by a spring (not shown) and positioned to be forced into any one of a plurality of apertures 79 circularly disposed about the shaft 76 in the adjacent end of the capstan. The pin 78 may be moved outwardly by the aid of a head member 80 which may be gripped by the operator.

Means is provided to automatically stop the actuation of the braiding unit at predetermined intervals or after a cord of a predetermined length has been formed. This means, in addition to mechanism for automatically disconnecting the braiding unit from its driving means, includes a braking means to quickly stop the unit. The braking means (Figs. 1, 2, 6, 7 and 8) comprises an endless chain 85 passing around sprocket wheels 86 and 87, one or both of which may be driven by constant speed driving means (not shown), for example that employed to drive the braiding unit 9, to advance the upper portion of the chain in the direction of the arrow at a predetermined speed during actuation of the braiding unit. Mounted upon the chain 85 is a cam block 88, the upper surface of which is tapered to ride beneath a brake actuating member 89 adjustably mounted upon a horizontal element 90. The member 89 is adjustably secured to the element 90 by means of a bolt or other suitable means extending through one of a plurality of elongated slots 91 in the element. This brake actuating member also has a tapered surface 92 positioned to be engaged by the tapered surface of the cam block 88 when riding therebeneath to cause movement of the member 89 and the element 90 upwardly through an arc controlled by a link 93 and a lever 94 which are pivotally secured to and support the element.

Brackets 98 rigidly mounted upon the table 8 pivotally support the link 93 and the lever 94. The lever 94, although shown in two parts fixed to the ends of a shaft journalled in its bracket, may be considered as a single lever to simplify the description. The upper end of the lever 94 is operatively connected to a lever 99 through an adjustable link 100, the lever 99 being pivoted at 101 to a stationary bracket or support 102 mounted upon the stationary portion 103 of the braiding unit 9. The stationary portion 103, as illustrated in Figs. 1 and 2, is circular in general contour, having an outwardly projecting annular

flange 104 upon which is movably disposed a brake ring 105 having secured thereto, at spaced positions, brake shoes 106. The general formation of the brake shoes 106 is illustrated in Figs. 6, 7 and 8, each brake shoe having a tapered surface 108 positioned away from a similarly tapered surface 109 of one of the rotatable carriers of the braiding unit so that when the brake shoes are raised these surfaces will be brought into intimate engagement to cause the brake shoes to stop rotation of the braiding unit. The brake ring 105, carrying the brake shoes 106, is moved through the actuation of the lever 99, the operative connection between the ring and the lever consisting of a pin 112 carried by the ring and receivable in the upper slotted end of the lever as illustrated in Fig. 1. It will be observed that through the action of the cam block 88, on the chain 85, in engagement with the actuating member 89 to move the element 90 in a clockwise arcuate path, controlled by the link 93 and the lever 94, clockwise movement is imparted to the lever 94 to rock the lever 99 counter-clockwise through the link 100, causing clockwise movement (Fig. 6) of the ring 105 and brake shoes 106. Cams 114 having tapered surfaces 115 are disposed in cut-away portions of the annular flange 104, where they are rigidly secured in place adjacent the brake shoes. Diametrically opposite the lever 99 and mounted upon the brake ring 105 is a latch cam 120 having a tapered surface 121 positioned to engage a latch 122. The latch 122 is pivotally mounted at 123 upon an arm 124 and is held in engagement with the tapered surface 121 by means of a flat spring 125. One end of the arm 124 carries a pin 126 which is movably disposed in an elongated aperture in the latch cam 120, while the other end of the arm is secured to one end of a tension spring 127, the other end thereof being fixed at 128 to a stationary support (not shown). A stationary lug 129 fixed to a suitable means (not shown) is positioned to be engaged by the latch 122 to hold the ring with the brake shoes in inoperative position. The mechanism actuated through the movement of the brake actuating member 89 caused by its engagement with the cam block 88 moves the brake ring 105 clockwise (Fig. 6) a sufficient distance to cause the latch cam 120 to move the latch 122 free of the stationary lug 129. When this takes place the spring 127 is rendered effective to cause a continued clockwise movement of the brake ring to move the brake shoes carried thereby so that their tapered surfaces 116 will ride on the tapered surfaces 115 of the cams 114 (Fig. 7) to move the tapered surfaces 108 of each brake shoe into intimate engagement with the tapered surface 109 of the rotatable carrier, thus stopping the braiding unit. The brake mechanism is held in this position until the operator is desirous of again causing actuation of the braiding unit 9 and chain 85, at which time the block 88 moves free of the member 89, allowing the entire brake mechanism to return to normal position against the force of spring 127 to move the latch 122 again into engagement with the stationary lug 129. The element 90 is of sufficient weight to cause the brake mechanism to return to normal position, yet if desired it may be assisted by a spring or other suitable means.

This brake means illustrates one means for stopping the actuation of the braiding unit. It should be understood that other means may be associated with the brake operating means to assist in stopping the braiding unit. For example, a switch (not shown) for opening and closing an electrical circuit through an electric motor, which might be employed to drive the braiding unit, the sprocket wheels 86 and 87 for the chain 85 and the capstan shaft 76, may be positioned to be closed by the element 90 as it reaches its uppermost position in the actuation of the brake means to open a circuit to the suggested motor, the switch being operable when the element 90 advances to its lowermost position to close the circuit. The possibility of employing such switch controlling means is apparent and not believed necessary to show in detail in order to illustrate the invention.

With this apparatus a continuous covering material is formed through selective stages of operation of the braiding unit, the latter being stopped at predetermined intervals through the braking means including the mechanism for actuating the brake shoes 106 and other means (not shown) associated therewith to disconnect the braiding unit from its actuating means. The time interval of operation of the braiding unit coupled with the speed of advancement of the finished products through the rotation of the capstan 75 determine the length of the strand assemblies formed by the apparatus. The length of these strand assemblies may be varied by securing additional actuating members 89 to the element 90 and/or by securing additional cams 88 to the chain 85. Furthermore, strand assemblies of varying lengths might be formed by varying the relative positions of the actuating members 89 on the element 90 or the relative positions of cam members 88 on the chain 85.

To illustrate the operation of the apparatus, let it be assumed that strand assemblies formed of two strands 12 are to be formed. While the braiding unit 9 is at rest the operator, by moving the treadle 38 downwardly against the tension of spring 45, causes the levers 51 and 56 to move counter-clockwise about the shaft 54 to lift the links 57 and therewith the actuating member 26. As shown in Figs. 1 and 2, the upper edge 27 of the actuating member 26 is positioned below the upper edge 21 of the tubular guide 22 upon which the retaining member 20 for the strand controlling elements 17 normally rests. Therefore, the vertical movement of the actuating member 26 from its lowermost position, shown in Figs. 1 and 2, to the position where its upper edge engages the retaining member 20 brings about the forming of slack loops in all the strands adjacent the reels 28. This slack in the strands is maintained, as illustrated in Fig. 3, as continued vertical movement of the actuating member, through the downward movement of the treadle 38, moves the retaining member 20 with the strand controlling elements 17 upwardly against the force of the spring 23 to move the upper ends of the elements beyond the braiding point 13 and above the gage member 61, Figs. 3 and 4. With the elements 17 in the raised position, the operator may select the strands he wishes to have embodied in the covering formed by the braiding unit. When the operation is first started the free ends of the strands project upwardly through the elements and are held against downward movement relative to the elements by the resilient members 19 (Fig. 5). The free ends of the selected strands may be removably secured to a suitable strand (not shown) which is threaded around the idler sheaves 74 and the grooves in the capstan 75

and eventually secured to a take-up reel (not shown). After the elements 17 and their actuating means have returned to their normal positions the braiding unit may then be set in motion, forming a covering on the selected strands, the braiding unit continuing the forming of the covering on the strands until the desired length has been reached, at which time the cam block 88 will ride beneath the member 89, causing actuation of the mechanism linked with the brake ring 105 to cause actuation of the brake shoes 106 to stop rotation of the braiding unit. At this point the operator may again actuate the treadle 38 to move the strand controlling elements 17 to their uppermost positions and if it is desired to form strand assemblies as illustrated in Fig. 10, this form having loops 120 and 121 in the strands free of the covering material, the operator may draw the strands through their respective elements 17, which is easily accomplished due to the slack loops formed near their reels, and hook the strands over selected retaining elements 66, as shown in Fig. 4. The strand controlling elements 17 are again allowed to return to their normal positions. The loops formed in the strands may represent the end of one strand assembly and the beginning of another. Although the covering is continuous this covering and the strands may be severed to form individual strand assemblies. To eliminate unravelling of the covering material when it is cut at the juncture of the strand assemblies, means has been provided to form a very close weave of the covering material at this point. This is accomplished by the operator withdrawing the pin 78 from the aperture 79, in which it is disposed, and allowing the pin to rest upon the surface of the capstan 75 the desired position between two of the apertures so that when the braiding unit is set in motion the shaft 76, which is operated in synchronism with the braiding unit, will not cause advancement of the strands until the arm 77 has been moved clockwise through the rotation of the shaft a sufficient distance to align the pin 78 with the next aperture and allow its spring (not shown) to cause operative connection between the shaft and the capstan. The close weave caused by this mechanism is illustrated at 122, Figs. 9, 10 and 11.

The operator may, if he chooses, continue to form the strand assemblies illustrated in Fig. 10 by carrying out the same steps as previously described. However, additional strands may be added to those already being presented to the braiding unit to form strand assemblies, as is illustrated in Figs. 9 and 11. This is brought about by moving the strand controlling elements to their uppermost positions, selecting the additional strand or strands, and fastening the free end or ends thereof to selected retaining elements 66, and after the controlling elements 17 have again been lowered and the braiding unit again set in operation, this additional or these additional strands will be included in the cover formed by the braiding unit. The retaining elements 66 are so constructed and embody sufficient resiliency to hold the strands until, during the advancement of the completed strand assemblies, they are pulled upwardly and freely released therefrom.

Although only three different types of strand assemblies are shown in the drawings, numerous other types of strand assemblies may be formed. Furthermore, only six strand controlling elements 17 are shown, but it should be understood that any desired number of these elements may be employed to present desired groups of strands to the cover forming means, namely the braiding unit. Furthermore, a plurality of strands may be passed through each element. It is, therefore, possible to present any desired number of strands to the cover, form measured loops at the juncture of the strand assemblies, which is accomplished through the gage member 61 and its adjustable retaining element 66, and if so desired any selected number of strands which has been fed to the braiding unit may be withdrawn therefrom by severing such strands while the strand controlling elements are in their raised positions.

In the present embodiment of the invention a braiding unit is illustrated for weaving a continuous cover to which strands may be fed, but it should be understood that the invention herein disclosed is illustrative only and may be widely modified and departed from in many ways without departing from the spirit and scope of the invention as pointed out in and limited only by the appended claims.

What is claimed is:

1. In a strand assembling apparatus, means operated intermittently for applying a continuous cover on a plurality of strands, and means to feed varying numbers of strands to the cover applying means between the intermittent operations thereof.

2. In a strand assembling apparatus, means operated intermittently for applying a continuous cover on a plurality of strands, means to feed a selected number of strands to the cover applying means between the intermittent operations thereof, and means associated with the feeding means to feed an additional strand to the cover applying means.

3. In a strand assembling apparatus, means operated intermittently for applying a common cover on a plurality of strands, and means to feed selected variable numbers of strands to the cover applying means between the intermittent operations thereof to form various types of strand assemblies.

4. In a strand assembling apparatus, means for applying a common cover on a plurality of strands, and means to feed strands selectively variable in number to the cover applying means to form various types of strand assemblies at predetermined intervals in the common cover.

5. In a strand assembling apparatus, a unit operable to weave a cover on advancing strands, means to interrupt the operation of the unit at predetermined intervals, means to cause portions of selected lengths of certain of the strands to be uncovered, and means to add selected other stands to the strands being covered.

6. In a strand assembling apparatus, a unit operable to weave a cover on advancing strands, means to interrupt the operation of the unit at predetermined intervals, means to move strands beyond the unit, and selective means to hold portions of varying lengths of certain of the strands free of the unit.

7. In a strand assembling apparatus, a unit operable to weave a cover on advancing strands, means to interrupt the operation of the unit at predetermined intervals, means to move strands beyond the unit, means to hold portions of certain of the strands free of the unit, and means to position an additional strand to be included in the cover.

8. In a strand assembling apparatus, a unit

operable to weave a cover on advancing strands, means to interrupt the operation of the unit at predetermined intervals, means to move strands beyond the unit, means to hold portions of certain of the strands free of the unit, and selective means to position an additional strand to be included in the cover and to hold a portion of variable length of the strand free of the unit.

9. In a strand assembling apparatus, a unit operable to weave a cover on advancing strands, means to guide strands under tension to the unit, means to interrupt the operation of the unit at predetermined intervals, and means operable to release the tension on the strands and move the guide means to position the strands free of the unit.

10. In a strand assembling apparatus, a unit operable to weave a cover on advancing strands, means to guide strands under tension to the unit, means to interrupt the operation of the unit at predetermined intervals, means operable to release the tension on the strands and move the guide means to position the strands free of the unit, and selective means to hold portions of varying lengths of certain of the strands free of the unit.

11. In a strand assembling apparatus, a unit operable to weave a cover on advancing strands, means to guide strands under tension to the unit, means associated with the guide means to limit the direction of movement of the strands relative thereto, means to interrupt the operation of the unit at predetermined intervals, and means operable to release the tension on the strands and move the guide means to position the strands free of the unit.

12. In a strand assembling apparatus, a unit operable to weave a cover on advancing strands, means to advance the strands during operation of the unit, and means to stop the advancement of the strands during operation of the unit to cause closer weaving of the cover.

13. In a strand assembling apparatus, a unit operable to weave a cover on advancing strands, means to advance the strands during operation of the unit, and means to stop the advancement of the strands at predetermined intervals during operation of the unit to cause closer weaving of the cover at selected portions.

14. A method of forming strand assemblies comprising weaving a continuous cover, feeding selected strands to the cover, and freeing portions of measured lengths of certain of the strands from the cover at certain intervals, and freeing other portions of different lengths at other intervals to form various types of strand assemblies.

15. A method of forming strand assemblies comprising weaving a continuous cover, feeding selected strands to the cover to form one type of strand assembly, and feeding certain other selected strands to the cover to form another type of strand assembly.

16. A method of forming strand assemblies comprising weaving a continuous cover, feeding selected strands to the cover to form one type of strand assembly, and discontinuing the feeding of certain of the strands to form another type of strand assembly.

17. A method of forming strand assemblies comprising weaving a continuous cover, feeding selected strands to the cover to form one type of strand assembly, discontinuing the feeding of certain of the strands, and feeding certain other strands to the cover to form another type of strand assembly.

18. A method of forming strand assemblies comprising weaving a continuous cover, feeding selected numbers of strands to the cover, and varying the number of strands fed to the cover to form different types of strand assemblies.

19. A method of forming strand assemblies comprising weaving a continuous cover, feeding selected numbers of strands to the cover at predetermined intervals to form strand assemblies with variable numbers of strands, and removing portions of certain of the strands from the cover at the juncture of the strand assemblies.

20. A method of forming strand assemblies comprising weaving a continuous cover on advancing strands, positioning selected strands to the cover, and stopping the advancement of the strands at predetermined intervals to cause closer weaving of the cover.

21. In a strand handling apparatus, a unit operable to weave a cover on advancing strands, means to interrupt the operation of the unit at predetermined intervals, means to move strands beyond the unit, and a plurality of holding members positioned measured distances beyond the unit for the selective holding of certain of the strand measured lengths free of the unit.

22. In a strand handling apparatus, a unit operable to weave a cover on advancing strands, means to interrupt the operation of the unit at predetermined intervals, means to move strands beyond the unit, and a plurality of holding members positioned measured variable distances beyond the unit for the selective holding of certain of the strand measured lengths free of the unit.

23. In a strand assembling apparatus, means to apply a common cover on strands, and means to cause portions of selected lengths of certain of the strands to be uncovered at certain intervals and cause other portions of lengths varying from the first mentioned lengths to be uncovered at other intervals to form various types of strand assemblies.

24. In a strand assembling apparatus, means operable to apply a common cover on core strands and conditioned to be stopped for the addition of another core strand, and means to add another core strand to those in the cover.

25. In a strand assembling apparatus, means operable to apply a common cover on core strands and conditioned to be stopped for the decreasing of the number of core strands, and means to decrease the number of core strands in the cover.

BEN K. FORD.