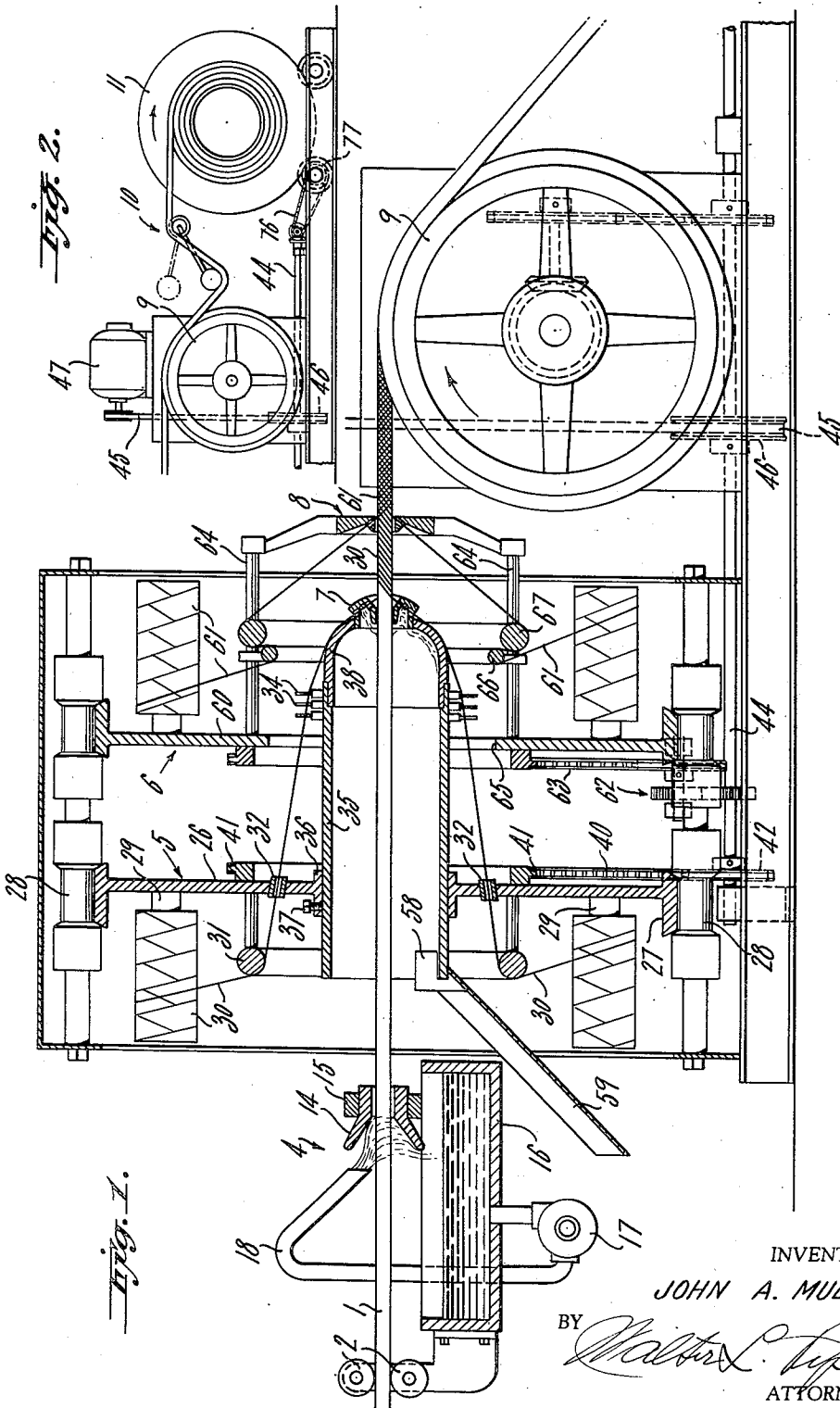


Sept. 14, 1937.

J. A. MULLER
CORD COVERED TUBE AND APPARATUS FOR APPLYING
CORDS TO TUBES, CORES, AND THE LIKE
Filed June 27, 1935

2,093,206

3 Sheets-Sheet 1



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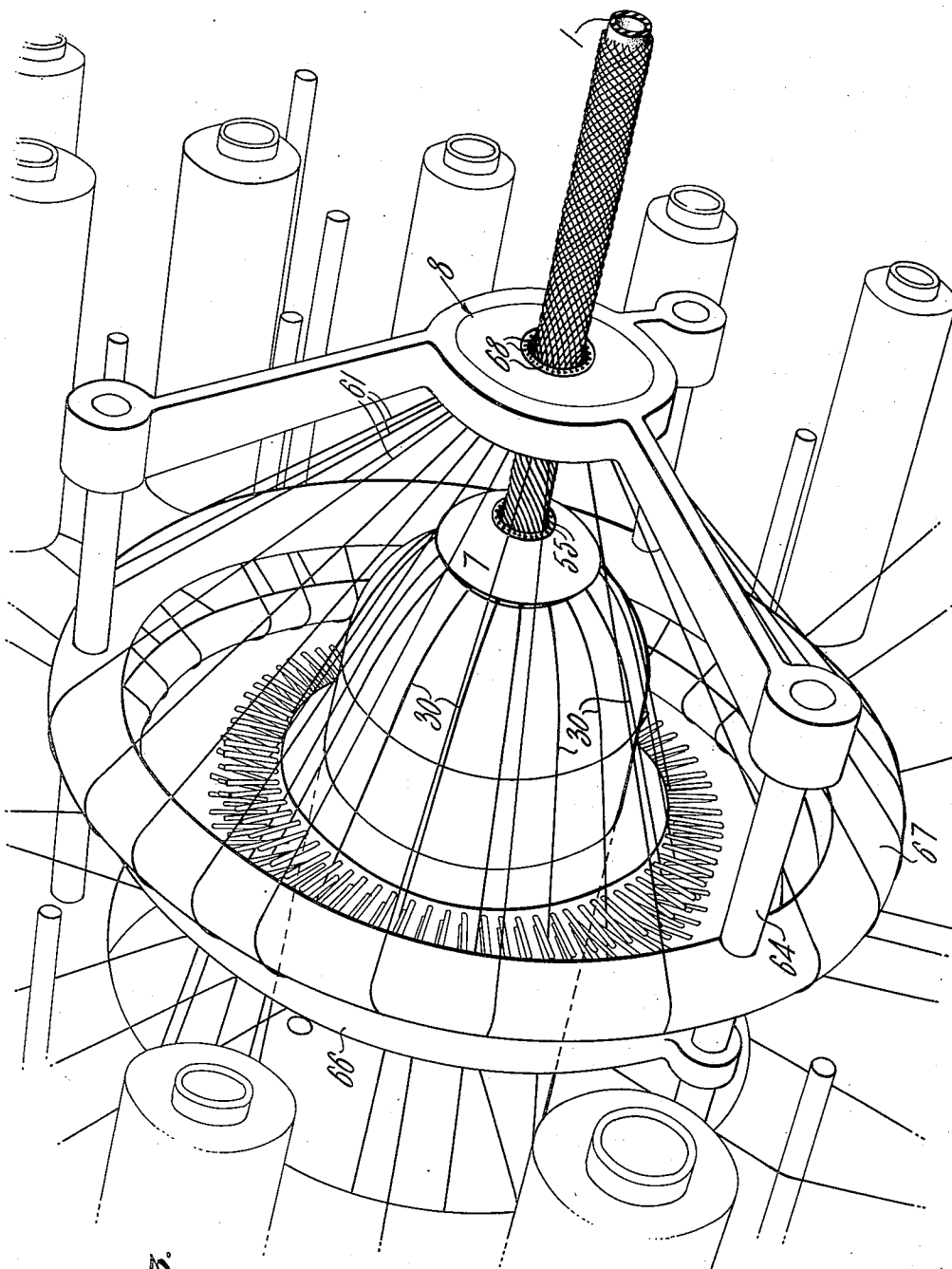
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3 Sheets--Sheet 2



3.

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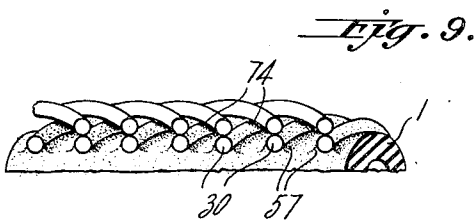
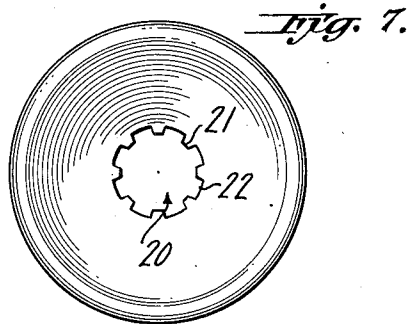
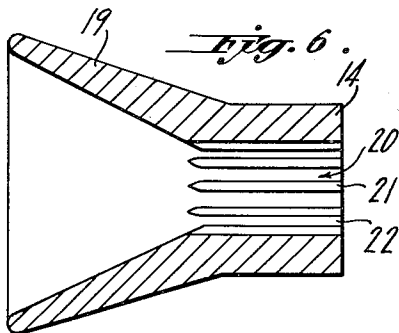
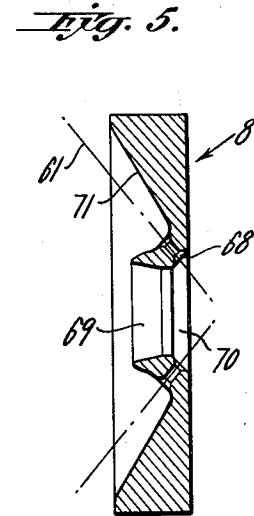
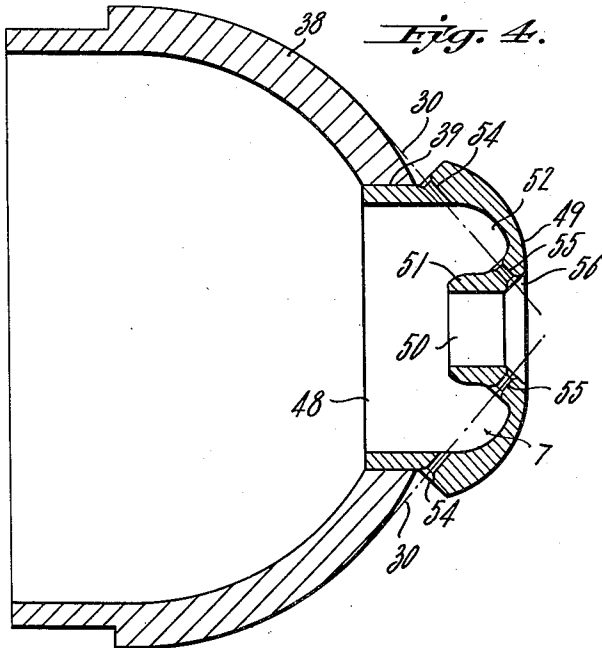
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3 Sheets-Sheet 3



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2,093,206

CORD COVERED TUBE AND APPARATUS
FOR APPLYING CORDS TO TUBES, CORES,
AND THE LIKEJohn A. Muller, Passaic, N. J., assignor to United
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corporation of Delaware

Application June 27, 1935, Serial No. 28,608

14 Claims. (Cl. 117—34.5)

This invention relates to cord covered tubes and apparatus for applying cords to tubes, cores and the like, and more particularly to cord wrappings for hose tubing and apparatus for making the same.

In applying cord wrappings to various types of cores, particularly rubber tubing forming the interior of hose, it has heretofore been necessary to apply the cords constituting each particular covering layer for the core in such close proximity that they are substantially tangentially arranged in order to avoid shifting and unequal distribution of the cords on the core. In general, it has been found necessary to apply a layer of soft sheeting, such as unvulcanized rubber, between the successive covering layers. This construction resulted in substantially continuous layers of cord separated by sheets of rubber. Since many such constructions, particularly hose, are provided with an outer covering of rubber over the reinforcing cords and core, it has been difficult to get a good bond between the outer covering and the inner core or tube. Such constructions afforded too limited possibilities of adjustment in design since the only possible alternative between different constructions was in the substitution of materials. Practically nothing can be done to vary the amount of reinforcing material required and still maintain the finished article with certain specific features. In many cases much more covering material was used than was needed to give the required strength. This is particularly true in the manufacture of hose.

I provide a fabric reinforcing construction in which it is possible to vary the spacing of the cords in each layer and in different layers, particularly by having the cords separated by desired distances, as distinguished from being in tangential relation. By my construction it is possible to broaden the possibilities of designs in various types of garden hose, air hose, and other articles where cord reinforcing layers are laid over cores.

In general, my method of construction consists in passing a core, usually a tubular section of plastic material, preferably rubber, through a device which applies a coating of liquid or semi-liquid adhesive. A rubber cement, which has the property of rapidly drying in air, is satisfactory as an adhesive. The core then progresses through a serving head upon which is mounted a suitable number of spools of reinforcing material, such as cotton yarn, threads, or cords, the term "cord" as used in this specification being intended to include any such reinforcing unit.

These cords are led through a guide of special design which permits them to be placed in a predetermined spacing upon the adhesive treated core. Rotating movement is given to the serving head so that, in combination with the progressive movement of the core, the cords are applied in parallel helices.

As the cords are in the process of being applied to the core they are treated with the adhesive so that they remain in a fixed position on the core by reason of the adhesive which forms beads between the surfaces of the cords and the core.

The core, with the applied layer of cords, progresses through a second serving head which operates in a reverse direction from the first serving head so that the second layer of cords has a reverse helical direction to the first layer thereby preserving the "balance" of the layers of reinforcement, it being customary practice to apply such layers in pairs of opposite inclinations.

With this construction the amount of reinforcing material applied to any core, or hose tube, can be varied as desired. Since the separated spacing of the cords results in definite spaces between the cords, it is possible for the outer rubber covering, which is later applied, to pass through the spaces or interstices of the layers of reinforcement and become firmly bonded to the inner core or tube, thereby producing a homogeneous product.

The accompanying drawings illustrate a present preferred embodiment of the invention and apparatus for making the same, in which:—

Fig. 1 is a longitudinal sectional view of a machine embodying my invention;

Fig. 2 is a side elevational view of another portion of the machine;

Fig. 3 is an enlarged view in perspective of a portion of a machine showing the application of the cords to the core;

Fig. 4 is a sectional view of one of the cord guides;

Fig. 5 is a sectional view of another cord guide;

Fig. 6 is a sectional view of the adhesive applying funnel;

Fig. 7 is an end view thereof;

Fig. 8 is a broken view of a piece of hose embodying the present invention; and

Fig. 9 is an enlarged detail view of a portion of a hose.

Referring to the drawings, a core 1, illustrated in the form of a tube of unvulcanized rubber, is passed through tension rolls 2, a device 4 for applying adhesive, and serving heads 5 and 6, 55

having cord guides 7 and 8, respectively, to a capstan 9. Layers of reinforcing cords are applied by each of the serving heads 5 and 6, the inclination of the layers deposited by the serving heads having opposite inclinations. From the capstan 9 the core and applied layers of reinforcement pass through a tensioning and guiding mechanism 10 to a wind-up reel 11. The construction of the cord guide 7, as hereinafter explained in detail, is such as to remove adhesive from the core 1 and apply it to the cords passing therethrough before they are applied to the core.

The adhesive applying device comprises a funnel 14, which is shown in detail in Figs. 6 and 7. The funnel 14 is supported by a bracket 15 attached to a tank 16 containing adhesive. A pump 17 draws adhesive from the tank 16 through a pipe 18 and discharges it into a bell-shaped mouth 19 in the funnel 14 and onto the core 1 as it is entering the throat or orifice 20 of the funnel 14. The throat or orifice 20 is provided with ribs 21 alternating with grooves 22. The ribs 21 hold the core or tube 1 in positive alignment in the orifice and, by virtue of the affinity of the adhesive to the core, the adhesive is drawn through the grooves 22 in the form of longitudinal ribs 24, shown in Fig. 8. The adhesive being in liquid or semi-liquid state and the space between the ribs 24 having been wetted as the core enters the funnel 14, the ribs 24 of adhesive flow over the surface of the core to the extent of blending with one another to form a universal envelope of adhesive, as indicated by the numeral 25 in Fig. 8. Before the force of gravity can cause the envelope of adhesive 25 to become concentrated on the underside of the core 21 and to drip, it is engaged in the cord guide 7 where it is dispelled, as hereinafter described in detail.

A wide variety of adhesives may be used with in the spirit of the invention, although I prefer to use a rubber cement which quickly dries in air.

The serving head 5 comprises a circular plate 26 which is disposed in a vertical position on an annular flange 27 which engages supporting rollers 28. The plate 26 carries a plurality of spindles 29 for the reception of spools or bobbins of yarn, thread, or cords 30. From the spindles 29 the individual cords 30 pass into a polished deflector ring 31 and through eyelets 32 in the plate 26, and then through tension pins 34 to the cord guide 7. The tension pins 34 are mounted on a sleeve 35 which is adjustably carried in a hub 36 formed in the plate 26. The sleeve 35 projects through an opening in the serving head 6. Accordingly, the relative position of the cord guide 7 with respect to the cord guide 8 may be varied by sliding the sleeve 35 back and forth in the hub 36. A set screw 37 is provided for securing the sleeve 35 in place. At its forward end the sleeve 35 carries a dome-shaped extension 38, shown in enlarged section in Fig. 4. Preferably, the dome 38 is secured to the sleeve 35 with a snug but removable fit. The cord guide 7 is, in turn, likewise fitted in the opening 39 at the end of the dome 38 so that it may be removed for inspection, or cleaning, or may be replaced with one for a different number or spacing of cords. Accordingly, the cord guide 7 rotates with the plate 26 and relative to the core 1 so that the cords 30 are helically applied to the core as it advances.

The plate 26 is turned or rotated by a chain 40 engaging a sprocket wheel 41. The chain 40 is connected to a sprocket 42 on a shaft 44. The shaft 44 is driven by a belt 45 and a pulley 46

from a motor 47, which also drives the capstan 9, so that the movements of the plate 26 and the capstan 9 are synchronized.

Referring particularly to Fig. 4, the cord guide 7 has an open face 48 facing interiorly of the dome 38. Its outer face 49 is rounded. An opening 50 for the passage of the core 1 is formed by a flange 51 projecting inwardly of the guide 7. The size of the opening 50 is such that excessive adhesive is removed or scraped from the core 1 by the flange 51. This removal is assisted by the rotation of the serving head.

The adhesive removed from the core flows into an annular pocket 52 to the rear of the flange 51. A series of holes 54, corresponding to the number of cords which are to be placed on the core, are formed through the side wall of the guide 7 in substantial alignment with the curved surface of the dome 38. Supplemental openings 55 extend through the inner wall of the guide and open into an enlargement 56 of the opening 50. Accordingly, the cords 30 travel through the interior of the guide and receive a coating of adhesive before they are applied to the core 1 in the enlargement 56 at the mouth of the guide. The application of the cords to the core immediately at the mouth of the guide 7 is an important feature of the invention since the relative positions of the cords are thus controlled by the spacing of the openings 55 without giving the cords a chance to be displaced due to their being suspended in air.

Referring to Fig. 9, the cords 30 when deposited in the adhesive on the core or tube 1 form beads 57 which hold the cords from slipping relative to the core. If a quick drying adhesive is used, the adhesive begins to set and prevents subsequent relative movement of the cords. The sleeve 35 is provided with a scraper 58 cooperating with a drain 59 for removing excess adhesive from the interior of the sleeve 35. It is desirable that the excess be removed before it becomes set.

The serving head 6 is, in general, similar to the serving head 5 and comprises a plate 60 carrying spools 61 of covering material. The plate 60 is driven from the shaft 44 through a reversing gear 62 and a chain 63 so that it turns in the opposite direction to the plate 26. Projecting rods 64 slidably support the cord guide 8. The plate 60 is provided with a large central aperture 65 through which the sleeve 35 projects. The cords 61 pass under a polished tension ring 66 and over a deflecting ring 67 on the way to the guide 8.

Referring to Fig. 5 the guide 8 differs from the guide 7 in that there is no pronounced cavity or pocket for the accumulation of adhesive and the cords pass through only a single series of inclined openings 68. A central opening or throat 69 for the passage of the core 1 has a surface which presents the least possible contact with the core 1 and the previously applied cords 30. There is also a bevelled surface 70 on the rear face. The throat 69 will remove any excess adhesive which may be adhering to the core and the applied cords, but it does not exert a scraping action as does the flange 51 in the guide 7. In general, it is desired that no adhesive shall collect on the guide 8 as its curved face 71 outside of the opening 69 is such that any adhering adhesive may be thrown onto other parts of the machine by centrifugal force, and that the cords 61 shall not be treated with adhesive before they pass through the opening 68.

The cords 61 are applied to the core substantially within the surface 70 so that the spacing

on the core and on the underlayer of cords 30 is determined by the position of the openings 68. As the previously applied cords 30 have been treated with adhesive, and adhesive may have accumulated from the core 1, beads of adhesive 74, shown in Fig. 9, form at the crossovers on the cords 30 and 61 thereby bonding the cords 61 to the cords 30. As previously stated, the cords 61 are laid in a reverse helical direction from the cords 30 thereby "balancing" the twist on the core 1. While I have shown the application of but two layers of cords, it is to be understood that the method and apparatus may be enlarged to provide for the application of more than two layers of cords.

After leaving the guide 8, the core and the applied cords pass around the capstan 9 and onto the wind-up reel 11. In winding the core and the applied layers of reinforcing material on the capstan 9 and the reel 11, care should be taken to prevent mechanical injury to, or displacement of, the cords until they have become permanently set by the adhesive. For this reason excessive tension should be avoided. The mechanism 10 provides a storage loop to prevent excessive or sudden tension, and may also serve to guide the core from side to side on the reel 11. Many similar mechanisms for this purpose are available on the market. The reel 11 is driven from the shaft 44 by a chain 76 connected to a supporting roller 77 so that it turns in synchronism with the rest of the apparatus.

The reel 11 may be transferred to any suitable apparatus for applying outer covering 78, as shown in Fig. 8, to the assembled core and covering layers. In the case of hose the covering layer is rubber and the assembly is vulcanized in a well known manner. Upon such a vulcanization the rubber in the covering 78 passes through the meshes between the cords 30 and 61 and is firmly bonded to the rubber of the core or tube 1 thereby forming a homogeneous structure. Where the reinforcing layers are tangentially engaging cords, difficulty often results in attempting to bond the outer covering to the core, and therefore intermediate layers of rubber are inserted between the cord layers and serve to hold the cords of successive layers in relative position and also aid in the problem of bonding. In the present invention it is usually possible to eliminate the use of such intermediate layers of rubber, although they may be applied, if desired.

By the present invention it is possible to cover a moving core or tube with layers of separated and spaced cords thereby permitting a wide variation in the design of article, a saving in the amount of covering material required, and an improvement of the bond between the core and the outer cover.

While I have shown and described a present preferred embodiment of the invention and method and apparatus for making the same, it is to be understood that the invention may be otherwise embodied and applied and other apparatus used within the spirit thereof and the scope of the appended claims.

Having thus described my invention, what I claim and desire to protect by Letters Patent is:—

1. In a covering machine, a plurality of rotatable serving heads, each having means for mounting spools of cords to constitute a separate covering layer, a cord guide mounted on each head, means permitting the adjustment of the relative positions of the guides, one of said serving heads being provided with an opening for the reception

of the guide carried by the other serving head whereby the cord guides are brought into proximity during the covering operation, means for rotating the serving heads, and means for moving a core through the cord guides whereby successive covering layers are deposited on the core during the rotation of the serving heads.

2. In a covering machine a plurality of rotatable serving heads, each having means for mounting spools of cords to constitute a separate covering layer, a cord guide mounted on each support, means for drawing a core through said heads, means for applying an adhesive to the core, one of said cord guides serving to remove excessive adhesive from the core and apply it to cords preparatory to their application to the core whereby adhesive on the core and cords serves to maintain the latter in separated spaced relation upon their application to the core, and means for rotating said serving heads.

3. In a covering machine a plurality of rotatable supports, each having means for mounting spools of cords to constitute a separate covering layer, a cord guide mounted on each support, means for moving a core successively through the cord guides, means for applying adhesive to the core preparatory to its passage through the first of said cord guides, said first cord guide being shaped to remove excessive adhesive from the core and apply it to cords passing therethrough preparatory to their application to the core, and means for rotating the supports whereby the cords applied from the first support are positioned on the core by the adhesive and the cords applied from the second support are maintained in fixed relation by the adhesive supplied to the cords.

4. In a covering machine a serving head having means for mounting spools of cords thereon, a cord guide carried by said serving head, said guide having openings for passing cords through its interior and an opening closely fitting a core, the openings by which the cords leave the guide being near said core opening and the span of the cords within the guide overhanging the inner surface of the core opening, means for moving the core through the cord guide, and means for applying adhesive to the core, whereby adhesive is removed from the core in the cord guide and applied to the cords within the serving head.

5. A cord guide comprising a shell having an open face and a substantially closed face, the closed face carrying an inwardly projecting flange defining a passageway for a core which flange together with the end wall of the shell defines a chamber, and a series of aligned openings disposed in different surfaces of the shell for conducting cords through the chamber within the cord guide.

6. A cord guide comprising a shell having an open face and a rounded outer face, said rounded outer face having an inwardly extending flange constituting an opening for a core which flange together with the end wall of the shell defines a chamber, and a series of aligned openings in opposed walls of the guide for conducting cords through the interior of the chamber and depositing them upon a core substantially within the outline of the guide.

7. In a covering machine a plurality of rotatable serving heads, each having means for mounting spools of cords to constitute a separate covering layer, a cord guide head carried by one of the serving heads and projecting through and independent of the second serving head, and a cord guide carried by the second serving head mounted

in close proximity to the first mentioned cord guide.

8. A hose wrapping machine comprising a rotatable serving head having a central opening, means for mounting spools of cord on the head, a cord guide carried by said support and having an opening for the passage of a tube and openings for passing cords therethrough in a suspended state adjacent to said tube opening, means for applying adhesive to the tube before it enters the cord guide, means for moving the tube through the cord guide, means for rotating the serving head, and means for removing adhesive from the tube at the cord guide opening and applying said adhesive to the cords.

9. A hose wrapping machine comprising a rotatable serving head having a central opening, means for mounting spools of cord on the head, a cord guide carried by said head and having an opening for the passage of a tube and openings for passing cords therethrough near said tube opening, means for applying adhesive to the tube before it enters the cord guide, means for moving the tube through the cord guide, means comprising said cord guide for removing adhesive from the tube and applying it to the cords, a second rotatable serving head having a cord guide in alignment with the first mentioned cord guide, and cord supporting means carried by the second head, and means for rotating the first and second heads, whereby a layer of cords is applied to the tube and a second layer of cords is applied to the first layer of cords.

10. A hose wrapping machine comprising a rotatable serving head having a central opening, means for mounting spools of cord on the head, a cord guide carried by said head and having an opening for the passage of a tube and openings for passing cords therethrough in close proximity to and behind the tube opening, means for applying adhesive to the tube before it enters the cord guide, means for moving the tube through the cord guide, means comprising the cord guide for removing adhesive from the tube and applying it to the cords, a second rotatable serving head having a cord guide in alignment with but spaced from but in proximity to the first mentioned cord guide, cord supporting means mounted on the second head, and means for causing rotation of the serving heads, whereby a layer of cords is applied to said tube and a second layer of cords is applied to the first layer and the layers of cords are deposited in proximity to each other.

11. A hose wrapping machine comprising a ro-

tatable serving head having a central opening, means for mounting spools of cord on the serving head, a cord guide carried by said serving head and having an opening for the passage of a tube and openings for passing cords therethrough in position to receive adhesive gathered at the tube opening, means for applying adhesive to the tube before it enters the cord guide, means for moving the tube through the cord guide, means comprising the cord guide for removing adhesive from the tube and applying it to the cords, a second rotatable serving head having a cord guide in alignment with the first mentioned cord guide, and cord supporting means, and means for driving the serving head in opposite directions, whereby a layer of cords is applied to the tube and a second layer of cords is applied to the first layer at an opposite inclination and the first layer is adhered to the tube and to the second layer with an adhesive bond.

12. A tube comprising a tubular core having a plurality of separate layers of cords each layer being wound thereon alternately in opposite directions, each layer comprising separated spaced parallel cords, said cords of the layers forming meshes extending from said core to the outer surface of the outer layer, and adhesive connection for maintaining the relative positions of the cords between themselves and relative to the core.

13. A tube comprising a tubular core, a layer of cords wound in spaced helical convolutions about said core, a second layer of cords wound about the first layer in an angular relation thereto, said cords of the layers forming meshes extending from said core to the outer surface of said second layer of cords, an adhesive connection for maintaining the relative positions of the cords between themselves and relative to the core, and a rubber layer having a vulcanized connection to the core through said layers.

14. A tube comprising a tubular rubber core, a layer of cords wound in spaced helical convolutions about said core, a second layer of cords wound in spaced helical convolutions about the first layer in the opposite direction thereto, said cords of the layers forming meshes extending from said core to the outer surface of said second layer of cords, an adhesive connection for maintaining the relative positions of the cords between themselves and relative to the core, and a second layer of rubber applied to said second layer of cords, said layer of rubber and core being vulcanized together and filling said meshes.

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