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SPIRAL WRAPPING MACHINE

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2 Sheets-Sheet 1

Fig. 1.

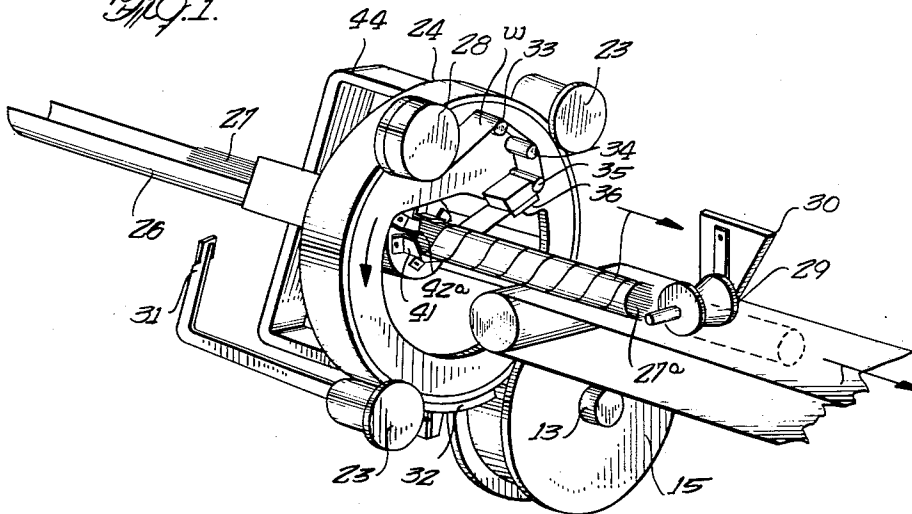
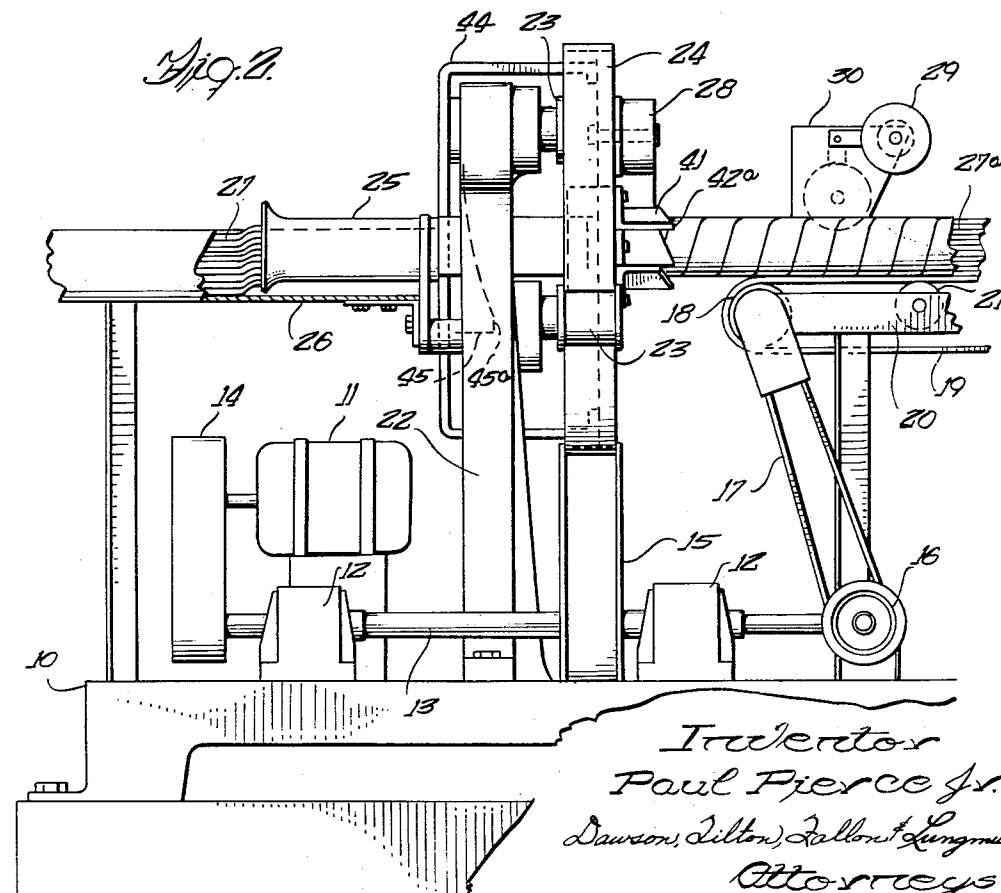


Fig. 2.



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SPIRAL WRAPPING MACHINE

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This invention relates to a spiral wrapping machine, and, more particularly, to a spiral wrapping machine for the wrapping of flexible objects.

Although spiral winding techniques have been available for a considerable period, they have been employed only infrequently on flexible objects. Representative of such objects are bunches of bristles, filaments, wires, etc., hoses, rods, and the like. When such objects are spirally wound, there is a tendency for the object to become distorted or flexed. This results in the object revolving in a planetary or orbital fashion about what would be its normal longitudinal axis. Further, the object tends to rotate about this axis, differentially in some cases, so as to assume a twisted or spiral shape. Still further, the distortion or flexure is intermittent, which imposes shock-like stresses on the web of wrapping material, tending to rupture the same. This makes for an uneconomical operation, since webs must be used that are stronger than those needed just to maintain the object in spirally-wrapped condition.

In the past, these difficulties have resulted in the employment of manual operations for wrapping flexible objects which otherwise might be advantageously spirally wrapped. Alternatively, those skilled in the art have gone to complex multi-web winders in an attempt to overcome the flexure problems—which winders have operated only imperfectly and at excessive cost. The winding of a group of filament-like material has proven especially vexatious, since there has been the tendency of the outermost members of the bundle to assume a spiral configuration which is not followed by the members positioned more interiorly of the bundle. When a completed bundle is transversely severed to provide a uniform package, filament-like elements of different lengths necessarily result, which is not only uneconomical, but results in inoperative elements for certain uses.

It is a general object of this invention to provide a novel spiral wrapping machine and one that solves the problems and difficulties set forth above. Another object is to provide in a spiral wrapping machine a unique guide means for stabilizing the elements being wrapped. Still another object is to provide a spiral wrapping machine which employs a plurality of buttressing elements selectively employable to limit axial displacement of the object being wrapped and which frictionally restrains the object so as to provide an advantageous rotational stability. Yet another object is to provide a spiral wrapping machine which is especially effective in the wrapping of bundle-like groups of filaments and which may employ low strength webs without either distorting the desirable parallel configuration of the filaments or disadvantageously stressing the web. Other advantages of the invention may be seen in the details of construction and operation set forth herein.

The invention is described in conjunction with an illustrative embodiment in the accompanying drawing, in which—

FIG. 1 is a fragmentary perspective view of a machine embodying teachings of this invention;

FIG. 2 is a fragmentary side elevational view, partially in section, of the machine seen in FIG. 1;

FIG. 3 is an end elevational view of a portion of the machine; and

FIG. 4 is a fragmentary enlarged side elevational view.

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In the illustration given, the machine is seen to be functioning to wrap a bundle of bristle-like filaments, but it is to be appreciated that the invention is capable of being used with equal facility on other types of deformable objects to be spirally wound. The machine illustrated is seen to include a base 10 (designated only in FIG. 2). The base 10 provides a support for a motor 11. The base 10 also provides spaced-apart bearings 12 in which a shaft 13 is journaled. The shaft 13 is driven by the motor 11 through a V-belt drive (not shown), but which is enclosed in the housing 14. Rigidly mounted on the shaft 13 between the bearings 12 is the shuttle drive wheel 15. A miter gear box 16 is mounted on base 10 and coupled to the shaft 13. The output of the gear box 16 is coupled by means of a chain 17 to a drive roller 18 rotatably supported on the frame 10. Entrained about the drive roller 18 is a conveyor belt 19 which serves to advance the object being wrapped through the machine and thereafter transport it to the site of further operations thereon. The conveyor, in the illustration given, includes side rails 20 and idler rollers 21 (only one shown) extending between the rails 20 and adapted to support the belt 19.

The base 10 also rigidly supports a yoke 22 equipped with idler rolls 23. Rotatably supported on the idler rolls 23 and the drive roll 15 is a shuttle 24.

Rigidly supported on the base 10 is a feed-in tube 25 which is positioned on the axis of the shuttle 24. Also supported on the base 10 is a supply trough 26 which serves to support filaments arranged in a bundle 27 as they are being introduced into the tube 25.

The shuttle 24 is equipped with a reel of wrapping paper or other webbing 28, which is applied to the bundle 27, the issuing end of the bundle 27a being supported on the belt 19 by means of a hold-down pulley 29. The pulley 29 is eccentrically, pivotally mounted on a bracket 30 which upstands from one of the side rails 20.

The speed of rotation of the shuttle 24 is regulated by means of positioning a brake handle 31 (see FIG. 1), the brake handle being interconnected with a brake shoe 32 provided on the yoke 22 and effective to frictionally engage the shuttle 24.

Referring again to FIG. 1, it will be seen that the roll 28 provides a wrapping web W which passes around posts 33 and 34 mounted on the side of the shuttle 24. Thereafter, the web W passes around an idler roller 35 and past a glue applicator mechanism 36. The glue or adhesive-equipped web W thereafter is directed around the bundle of filaments 27 to provide the wrapped filament portion or issuing bundle 27a of FIG. 1.

In the operation of the machine thus far disclosed, the bundle of filaments is fed into the tube 25 and this may be performed either manually or mechanically, as desired. The leading end of the filament bundle 27 is passed through the tube 25 to extend out of the discharge and a sufficient distance to be grasped, either manually or mechanically, as desired. As the spiral wrapping operation continues, the leading end of the bundle 27 is confined between the hold-down pulley 29 and the belt 19, and the movement of the belt 19 is effective to continually move the bundle 27 through the shuttle 24. For this purpose, a variety of advancing means may be employed, inasmuch as mechanisms for advancing purposes are well known in this art. During this advancement, the web roll W orbits in planetary fashion about the rotational axis of the shuttle 24.

Referring now to FIG. 4, it is seen that a housing 37 is mounted on the tube 25 so as to be non-rotatably related to the base 10. As can be seen from a consideration of FIGS. 3 and 4, a plurality of rods 38 are reciprocally mounted within the housing 37 in circumferentially spaced-apart relation. Each rod 38 adjacent

the object entering end of the machine is equipped with a bracket 39 carrying a cam follower roller 40. The discharge end of each rod 38 is equipped with an L-shaped, flat-surfaced finger member 41, the finger members 41 being arranged as can be appreciated in FIG. 3 to substantially confine by tangential contact the periphery of the filament bundle 27. Each finger 41 is further equipped with a bevel as at 42, and the L-shaped finger element is urged to a retracted position relative to the shuttle 24 by means of a coiled spring 43 positioned about the rod 38 and extending between the bracket 39 and the housing 37.

The shuttle 24 is equipped with a rearwardly-extended portion 44 which carries a cam 45 effective to contact all of the cam follower rollers 40. The cam surface is arranged with one high point as at 45a, and this point is effective to extend the fingers 41 in sequence away from the shuttle 24, i.e., longitudinally of the machine towards the discharge or leading end thereof. Further, the high point 45a of the cam 45 is positioned to extend the particular finger 41a which is effective to oppose the action of the web W and distorting the filament bundle 27. This can be seen in FIG. 3. The reciprocable movement of each finger corresponds to the width of the web W. As can be seen from a consideration of FIG. 1, the bevel or angle-shaped end has its point on the side 42a of the finger last contacted by said web. Here, it is to be appreciated that the movement of the fingers 41 may be such that the side of the web W adjacent the machine entering end just wipes past the beveled end 42, insuring continuous buttressing for the article being wrapped.

It will be noted that the fingers 41 in the illustration given are in abutting relation along their longitudinal sides, which is particularly effective when a filament bundle is being wrapped. It will be appreciated that the number of fingers 41 employed as buttressing or reinforcing elements may be varied with the size of the object being spirally wrapped. In the instance of larger diameter objects, a greater number of fingers may be employed without unduly complicating the machine.

While, in the foregoing specification, I have set forth a detailed description of an embodiment of the invention for the purpose of illustration thereof, many modifications in the details herein given may be made by those skilled in the art without departing from the spirit and scope of the invention.

I claim:

1. In apparatus for spiral winding, a frame, a web source mounted on said frame for planetary movement about a given axis, said web source providing a length of wrapping material for application to a flexible article on said axis, means for advancing said article along said axis, means on said frame for interposing rigid support means adjacent said article to oppose the tension of said wrapping material, and tube means on said frame about said axis, said interposing means being mounted on said tube means and constrained against planetary movement about said axis.

2. In apparatus for spiral winding, a frame, a web source mounted on said frame for planetary movement about a given axis, said web source providing a length of wrapping material for application to a flexible article on said axis, means on said frame for sequentially positioning a plurality of buttressing elements in contact with said article on the side thereof opposite the point of tangential contact of said web with said article, said positioning means being mounted on said frame in fixed angular relation to said axis.

3. In apparatus for spiral winding, a frame, a web source mounted on said frame for planetary movement about a given axis, said web source providing a length of wrapping material for application to a flexible article on said axis, a tube mounted on said frame adapted to direct said article along said axis, a plurality of support

elements circumferentially mounted on said tube for reciprocable axial movement, and means on said frame for sequentially moving said elements.

4. In apparatus for spiral winding, a frame, a web source mounted on said frame for planetary movement about a given axis, said web source providing a length of wrapping material for application to a flexible article on said axis, a tube mounted on said frame adapted to direct said article along said axis, a plurality of support elements circumferentially mounted on said tube for reciprocable axial movement, and cam means mounted on said frame for cooperative movement with said web source for sequentially moving said elements.

5. In apparatus for spiral winding, a frame, a web source mounted on said frame for planetary movement about a given axis, said web source providing a length of wrapping material for application to a flexible article on said axis, a plurality of flat surfaced support elements mounted on said frame for reciprocable axial movement, said elements being circumferentially disposed about said axis, and means for sequentially reciprocating said elements.

6. In apparatus for spiral winding, a frame, a web source mounted on said frame for planetary movement about a given axis, said web source providing a length of wrapping material for application to a flexible article on said axis, means for advancing said article along said axis, a plurality of flat-surfaced support elements mounted on said frame for reciprocable axial movement, said elements being disposed in circumferential abutting relation, and means on said frame for sequentially reciprocating said elements.

7. In apparatus for spiral winding of elongated flexible articles, and the like, a frame, a shuttle rotatably mounted on said frame, a web roll on said shuttle arranged to orbit about the rotational axis of said shuttle, means on said frame for advancing a flexible article along said axis for wrapping engagement with a continuous web from said web roll, a plurality of tension opposing members mounted on said frame for reciprocable axial movement, and means on said frame for cyclically moving said members.

8. In apparatus for spiral winding of elongated flexible articles, and the like, a frame, a shuttle rotatably mounted on said frame, a web roll on said shuttle arranged to orbit about the rotational axis of said shuttle, means for advancing a flexible article along said axis for wrapping engagement with a continuous web from said web roll, a plurality of tension opposing members mounted on said frame for reciprocable axial movement, and means on said shuttle engaging said members for cyclically moving the same.

9. In apparatus for spiral winding of elongated flexible articles, and the like, a frame, a shuttle rotatably mounted on said frame, a web roll on said shuttle arranged to orbit about the rotational axis of said shuttle, means for advancing a flexible article along said axis for wrapping engagement with a continuous web from said web roll, a housing on said frame equipped with an aperture permitting said article to pass therethrough, a plurality of fingers circumferentially mounted in said housing for reciprocable axial movement, and means on said shuttle for sequentially moving said fingers to oppose any distortion of said article induced by said web.

10. In apparatus for spiral winding of elongated flexible articles, and the like, a frame, a shuttle rotatably mounted on said frame, a web roll on said shuttle arranged to orbit about the rotational axis of said shuttle, means on said frame for advancing a flexible article along said axis for wrapping engagement with a continuous web from said web roll, a plurality of tension opposing members mounted on said frame for reciprocable axial movement, the reciprocable movement of said members corresponding to the width of said web, and means on said frame for sequentially moving said members.

11. In apparatus for spiral winding of elongated flex-

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ible articles, and the like, a frame, a shuttle rotatably mounted on said frame, a web roll on said shuttle arranged to orbit about the rotational axis of said shuttle, means on said frame for advancing a flexible article along said axis for wrapping engagement with a continuous web from said web roll, a plurality of tension opposing members mounted on said frame for reciprocable axial movement, said members being equipped with portions extending parallel to said axis, the ends of said portions adjacent the article exiting end of said frame being beveled, and means on said frame for sequentially moving said members to oppose any distortion of said article induced by the tension of said web.

12. In apparatus for spiral winding, a frame, a web source mounted on said frame for planetary movement about a given axis, said web source providing a length of wrapping material for application to a flexible article on said axis, means for advancing said article along said axis, an apertured housing on said frame adapted to pass

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said article through the aperture thereof, a plurality of fingers mounted in said housing circumferentially about said aperture for reciprocable axial movement, said housing being mounted on said frame adjacent one side of said web, and means on said frame for sequentially moving said fingers to oppose the tension of said web and over a path substantially coextensive with the width of said web, said fingers at the ends thereof adjacent the other side of said web being longitudinally beveled in the direction of rotation of said web source.

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