

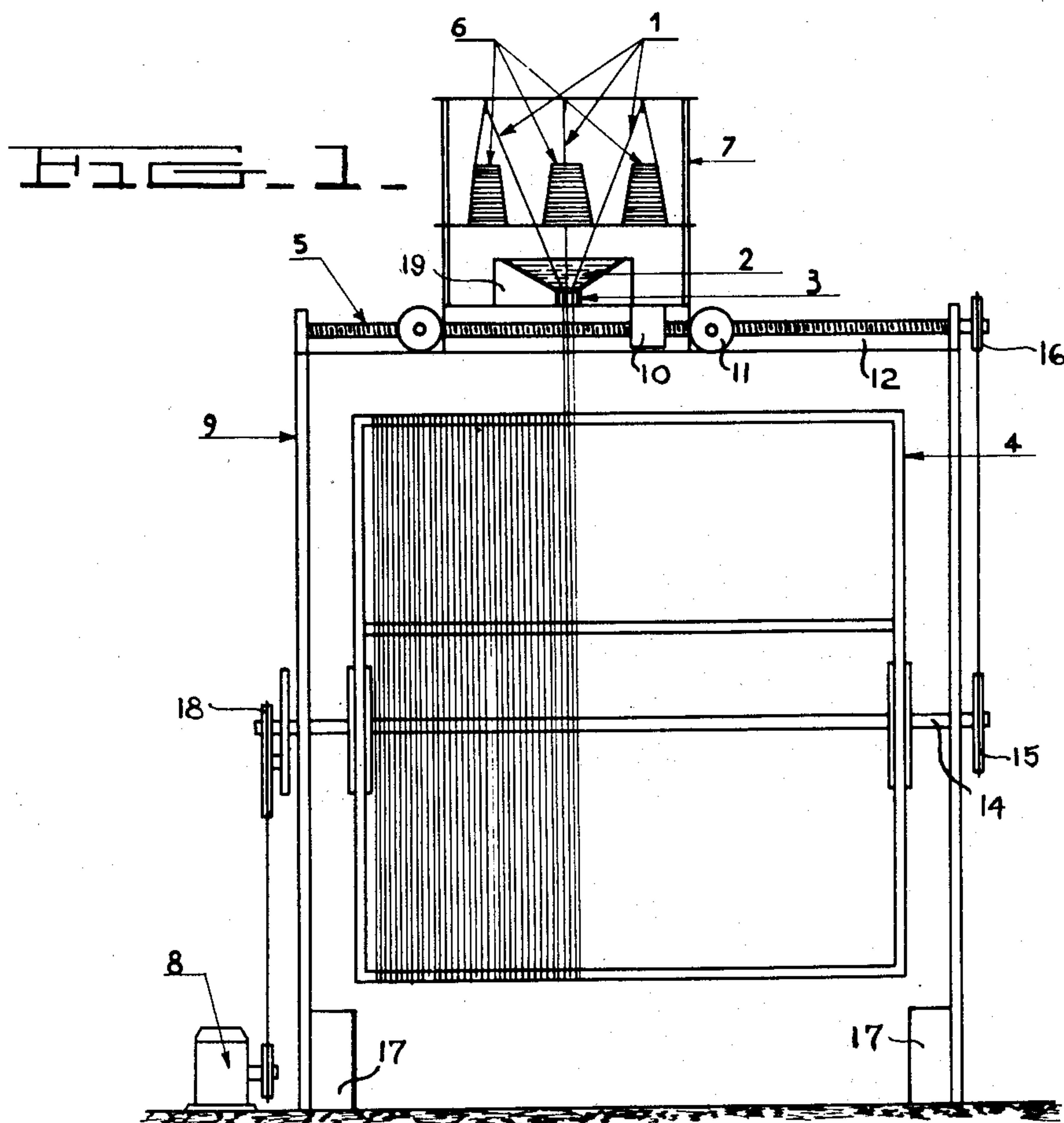
Feb. 17, 1953

E. V. BITTERLI ET AL
APPARATUS FOR COATING AND UNITING TEXTILE
CORDS TO FORM A WEFTLESS FABRIC

2,628,655

Filed July 8, 1948

2 SHEETS—SHEET 1



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By *Adams + Bush*
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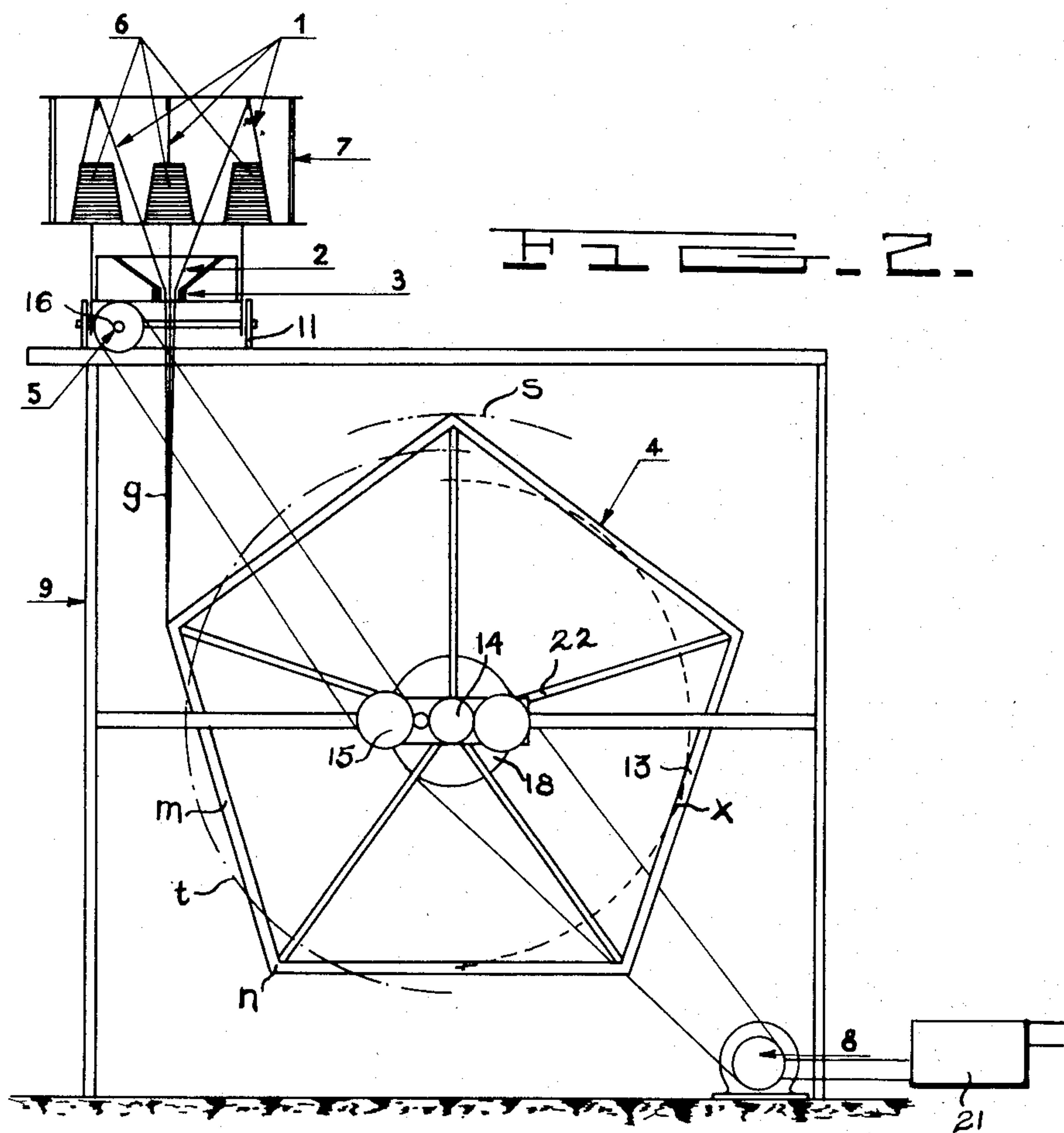


FIG. 2.

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FIG. 2a



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2,628,655

APPARATUS FOR COATING AND UNITING
TEXTILE CORDS TO FORM A WEFTLESS
FABRIC

Emile V. Bitterli, Zurich, Switzerland, and Max Forrer, deceased, late of Paris, France, by Anne-Marie Jouvett Forrer, Paris, France, widow and heir and guardian of minor heirs, assignors to Compagnie Generale d'Electricite, Paris, France, a corporation of France

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8 Claims. (Cl. 154—1.75)

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Our invention relates to textile cords or fabrics or objects comprising parallel threads to which have been applied resinous or plastic binding material for the purpose of enhancing tensile strength, and in particular relates to the type of reinforced cotton cords used in automobile tires.

An object of our invention is to provide a method and apparatus for orienting a plurality of threads in parallel relation and binding them in that relation by the application of a resinous or plastic material, and immediately subsequently reeling and drying them.

Another object of our invention is to provide liquid treatment and reeling apparatus for textile threads, in which the traversing guide for advancing the treated thread on a take-off reel is an integral part of the device for applying the liquid treatment.

A further object of our invention is to provide means for continuously applying plastic binder material symmetrically and evenly to textile cords.

Another object of our invention is to control accurately the amount of plastic material which is applied to textile cords.

A further object of our invention is to provide means for reeling and drying cords to which plastic material has been applied, while keeping the component threads parallel.

Still another object of our invention is to provide means for conducting in a vertical direction the cords to which plastic material has been applied, for the purpose of controlling the symmetry of the plastic application.

Yet another object of our invention is to provide a method for making molded objects to resist tension and reinforced with uniformly distributed textile threads.

Other objects will be apparent from the following description.

Our invention will be understood by reference to the following specification and to the accompanying drawings wherein like characters of reference refer to the same parts and wherein:

Figure 1 is a front elevation of the apparatus with the front wall of the drying oven removed; and

Fig. 2 is a side elevation of the apparatus with the wall of the drying oven removed.

Fig 2a shows the mean and the extreme oblique positions of the resin-treated cord during its travel from the die to the reel as the reel rotates.

We prefer to use relatively small threads and to use a plurality of threads to form a cord, and

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to guide each thread in a separate path while it passes through the bath of liquid plastic to be applied. However, a single thread may be employed. The use of a plurality of threads with a larger die aperture makes possible more rigid control of the die aperture, and with a small aperture there is much greater risk of clogging due to knots or irregularities or small pieces of foreign matter getting caught on the die plate.

Referring to the drawings in detail, the virgin threads 1, 1, are wound on loading spools 6 which are carried on a carriage 7. On the carriage 7 is also carried, below or above spools 6, a container or bath 2 containing liquid binding or plastic material, as resinous material, to be applied to the threads. On the upper portion of carriage 7, and above loading reels 6, there is mounted a rack member 23 which carries above the respective loading reels, individual eyelets 24, 24, 24, through which the threads from the several loading reels are guided. The container 2 has in its bottom base wall, or in its top face, a drawplate or die 3 having an accurately calibrated aperture, preferably round, through which the threads pass after the plastic material has been applied thereto during passage through the liquid plastic material in container 2, and in which the threads are united together into one cord. Excess plastic material beyond the desired uniform size of the treated cord to produce a symmetrical cord, is scraped off by the die plate.

The container 2 comprises heating means 19 for keeping the plastic or resinous material therein in a liquid or semi-liquid condition. A suitable material to be used for the purposes here in view is a synthetic resin of the phenol formaldehyde type. The size of the aperture in die 3 which will not allow free plastic to run out alongside the threads depends on the viscosity of the plastic. A solvent or dispersing agent may also be added to the plastic bath to liquefy it.

In the drawings, we have shown the drawplate or die 3 positioned in the bottom face of the container 2, which is the preferred form. A plurality of dies 3 may be positioned in the bottom face of one container 2, each having an aperture through which bundles of threads pass.

A closed chamber or casing 9 comprises an outer supporting frame, on the top of which is positioned a guiding rail 12. Suitably journaled in side-walls of casing 9, and extending parallel to rail 12, is a shaft 14, fixedly carrying a take-off reel 4 for winding up the cords immediately after resin treatment, as they come from die 3.

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A desirable shape for reel 4 is polygonal, and preferably a pentagon shape for reel 4 is employed. The casing 9 is preferably mounted below carriage 7, but may be mounted above it.

When there is employed a polygonal reel with flat faces upon which the resin-treated cords are wound parallel, by suitable treatment, the adjacent cords on the reel can be made to adhere to each other as by being wound closely contiguous, forming a series of flat plates which after drying can be cut apart, yielding flat plates whose tensile strength in one direction is enhanced by the parallel cords.

The carriage 7 has rollers 11, 11, which run on rail 12, and guide carriage 7 parallel to drive-shaft 14 of the reel. A threaded lug or nut 10 is provided on the bottom of carriage 7, which engages a threaded shaft 5 extending parallel to rail 12. A motor 8 through pulley 18 drives reel shaft 14. Shaft 5 has a pulley 16 which is driven by pulley 15 carried on shaft 14, so that motor 8 causes both the rotating motion of reel 4 and the traversing movement of carriage 7. Motor 8 has a reversing switch 21 which can reverse the direction of rotation of motor 8 and hence of reel 4.

Inside of casing 9 there are provided suitable steam or electrical or other heating units 17, 17, to impart dry heat to casing 9 for drying the liquid plastic which has been applied to the cords wound on reel 4. Vulcanization, or other physical or chemical treatment such as polymerization, may also be performed in casing 9. Suitable reduction is provided in the drive connection between shaft 14 and shaft 5.

The loading spools 6, 6, 6, are positioned so that the several threads unwound respectively therefrom traverse separate individual paths through the liquid plastic material in container 2, and form substantially elements of a cone whose vertex is at their common round outlet aperture in die 3. This assures good application of the plastic to each thread. The use of the die plate 3 in the wall of container 2 is decidedly preferable to the use of a separate traveling guide eye, remote from container 2, moving in the direction of the axis of the reel, which involves serious risk of clogging and of unsymmetrical application of resin.

If reel 4 is a cylinder, the rail 12 is so positioned in the direction perpendicular to 14, that the vertical line passing through the outlet aperture in die plate 3 is tangent to the cylindrical face of reel 4, and the cord is drawn on to the cylindrical reel at uniform speed.

However, preferably, we employ for the reel 4, a regular polygon frame, having flat sides, that is, a prism, and preferably we employ a pentagon as shown. The pentagon has sides 13 and radial supporting ribs 22. The slight variations of the speed at which the cord is reeled are compensated for by other advantages.

In Fig. 2 there are shown the circumscribed circles of the pentagon, and the inscribed circle x of the pentagon, passing respectively through the vertices n and the midpoints m of the sides. In Fig. 2 there is also shown the "contact" circle t which is concentric with circles s and x , and is radially midway therebetween.

When a polygonal shape of reel 4 is used, the rail 12 is so positioned in the direction perpendicular to axis 14 of the reel 4, that the vertical line g passing through the round outlet aperture in die 3 is tangent to this intermediate circle t . As the polygonal reel 4 rotates, the treated cord

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is displaced transversely through vertical mean position g , between extreme oblique positions h and k (Fig. 2a), corresponding respectively to vertices n and side midpoints m of the polygon, so that the deviation of the treated cord from the vertical is kept at a minimum, and any tendency for the resin to accumulate unsymmetrically on one side of the cord is minimized. Variations in the speed at which the cord is wound on the reel are also thus minimized.

The use of the polygonal shape for reel 4 provides for much better and more rapid drying than would a cylindrical frame of the same space requirement. A polygon of a large number of sides would not provide for as rapid drying as would a pentagon, and the large number of vertices of such a polygon also would cause the resin to be squeezed out of the cord at numerous closely spaced points, and to flow or drip in a particular direction, causing irregularities. On the other hand, a polygon of three sides would cause such a large deviation between the extreme positions h and k of the treated thread, and periodic variation of winding speed, such that the plastic resin would be carried unsymmetrically on the cord as it goes to the reel. We have found by experiment that a pentagon reel 4 gives optimum results as to drying performance, and maintenance of closest approximation of direction and speed of the cord during winding on the reel.

In operation, the virgin thread is supplied mounted on the spools 6, 6, 6, and the individual threads are guided through separate paths through the liquid plastic in container 2, immediately on to the reel 4. As reel 4 rotates it causes traversing movement of carriage 7 carrying plastic container 3, and advances the winding position of the impregnated cord delivered from die plate 3 in container 2. The pentagon shape of reel 4 provides for maximum drying effect and minimum variation in direction and speed of travel of the cord travelling from die 3 to reel 4. There is one continuous operation starting with the unwinding from the loading spools, through the liquid plastic bath and passage through the die plate, to the winding on the take-off reel and drying.

After all available thread has been treated with resin has been wound on to the take-off reel 4, the rotation of the take-off reel by the motor drive may be continued for completion of the drying or other treatment conducted within casing 9. During such rotation of the reel in one direction, liquid resin will tend to run or drip in a particular direction at points on the wound cord, particularly at the vertices of the reel, causing unsymmetrical distribution of the resin on the cord. This effect can be much reduced by periodically reversing the direction of rotation of the reel by throwing reversing switch 21.

It will be apparent that we have provided a novel and useful apparatus and method for applying plastic to textile threads and producing objects therefrom.

To those skilled in the art it will be apparent that our invention is capable of being modified to adapt it to particular conditions, and all such modifications which are within the scope of the appended claims we consider to be comprehended within the spirit of our invention.

We claim:

1. In apparatus for applying plastic material to textile threads and for binding said threads

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close together in parallel relation by means of said plastic material, a loading reel, a container containing liquid plastic material, a take-off reel having an axis, means comprising a frame for rotatably mounting said take-off reel beneath said loading reel and said container, means for reversibly rotating said take-off reel about said axis, a die-plate in the base of said container having therein an aperture for the passage there-through of a thread from said loading reel after its passage through said plastic material and for controlling the amount of plastic material carried by said thread upon leaving said container, said die plate and said means for rotatably mounting said take-off reel being so arranged that the said aperture of said die plate constitutes the last guiding means traversed by said thread before it is wound on said take-off reel and said thread traverses a straight path directly from said aperture to its position on said take-off reel, a guide-way mounted on said frame for guiding said container and its said die-plate in a direction parallel to said axis, said guide-way being so positioned on said frame that a vertical line through said aperture of said die-plate is substantially tangent to the path of the periphery of said take-off reel as it rotates, whereby the path of said thread from said die-plate to said take-off reel is substantially vertical, and synchronous drive means for causing traversing movement of said container and its die-plate along said guide-way parallel to said axis in synchronism with the rotation of said take-off reel.

2. In apparatus for applying plastic material to textile threads and for binding said threads close together in parallel relation by means of said plastic material, a plurality of loading reels, a container containing liquid plastic material, a take-off reel having an axis, means comprising a frame for rotatably mounting said take-off reel beneath said loading reel and said container, means for reversibly rotating said take-off reel about said axis, a die plate in the base of said container having therein an aperture for the passage therethrough of a bundle of threads drawn respectively from each of said loading reels, said die plate and said means for rotatably mounting said take-off reels being so arranged that said aperture of said die plate constitutes the last guiding means traversed by the bundle of threads before it is wound on said take-off reel and said bundle traverses a straight path directly from said aperture to its position on said take-off reel, said die plate and said loading reels being so positioned that the threads from each of said loading reels respectively traverse separate paths through the plastic material in said container in passing from said loading reels to said die plate, said aperture controlling the amount of plastic material carried by said bundle of threads upon leaving said container, a guide-way mounted on said frame for guiding said container and its said die-plate in a direction parallel to said axis, said guide-way being so positioned on said frame that a vertical line through said aperture of said die-plate is substantially tangent to the path of the periphery of said take-off reel as it rotates, whereby the path of said bundle of threads from said die-plate to said take-off reel

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is substantially vertical, and synchronous drive means for causing traversing movement of said container and its die-plate along said guide-way parallel to said axis in synchronism with the rotation of said take-off reel.

3. Apparatus according to claim 1, said take-off reel having the shape of a right prism whose base is a regular polygon, and said guide-way being so positioned on said frame that a vertical line through said aperture of said die-plate is substantially tangent to a contact circle which is radially mid-way between the circumscribed and inscribed circles of said regular polygon.

4. Apparatus according to claim 1, said take-off reel having the shape of a right prism whose base is a regular pentagon, and said guide-way being so positioned on said frame that a vertical line through said aperture of said die-plate is substantially tangent to a contact circle which is radially mid-way between the circumscribed and inscribed circles of said regular pentagon.

5. Apparatus according to claim 1, and a casing in which said take-off reel is housed.

6. Apparatus according to claim 1, and carriage means carrying said container and whereon said loading reel is vertically mounted, said carriage means being mounted for movement on said guide way, and said synchronous drive means being connected for causing traversing movement of said carriage means.

7. Apparatus according to claim 2, and carriage means carrying said container and whereon said loading reels are vertically mounted, said carriage means being mounted for movement on said guide way, and said synchronous drive means being connected for causing traversing movement of said carriage means.

8. Apparatus according to claim 2, and carriage means carrying said container and whereon said loading reels are vertically mounted, said carriage means being mounted for movement on said guide way, said synchronous drive means being connected for causing traversing movement of said carriage means, rack means mounted on said carriage means above said loading reels, and a plurality of individual eyelet means carried on said rack means respectively corresponding to said loading reels and respectively adapted to guide threads travelling from said loading reels to said aperture in said die plate.

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ANNE-MARIE JOUVET FORRER,

Individually as widow, and also as guardian of her minor children Anne Marie Marthe Sylvie Forrer and Caroline Forrer, heirs-at-law of Max Forrer, deceased.

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