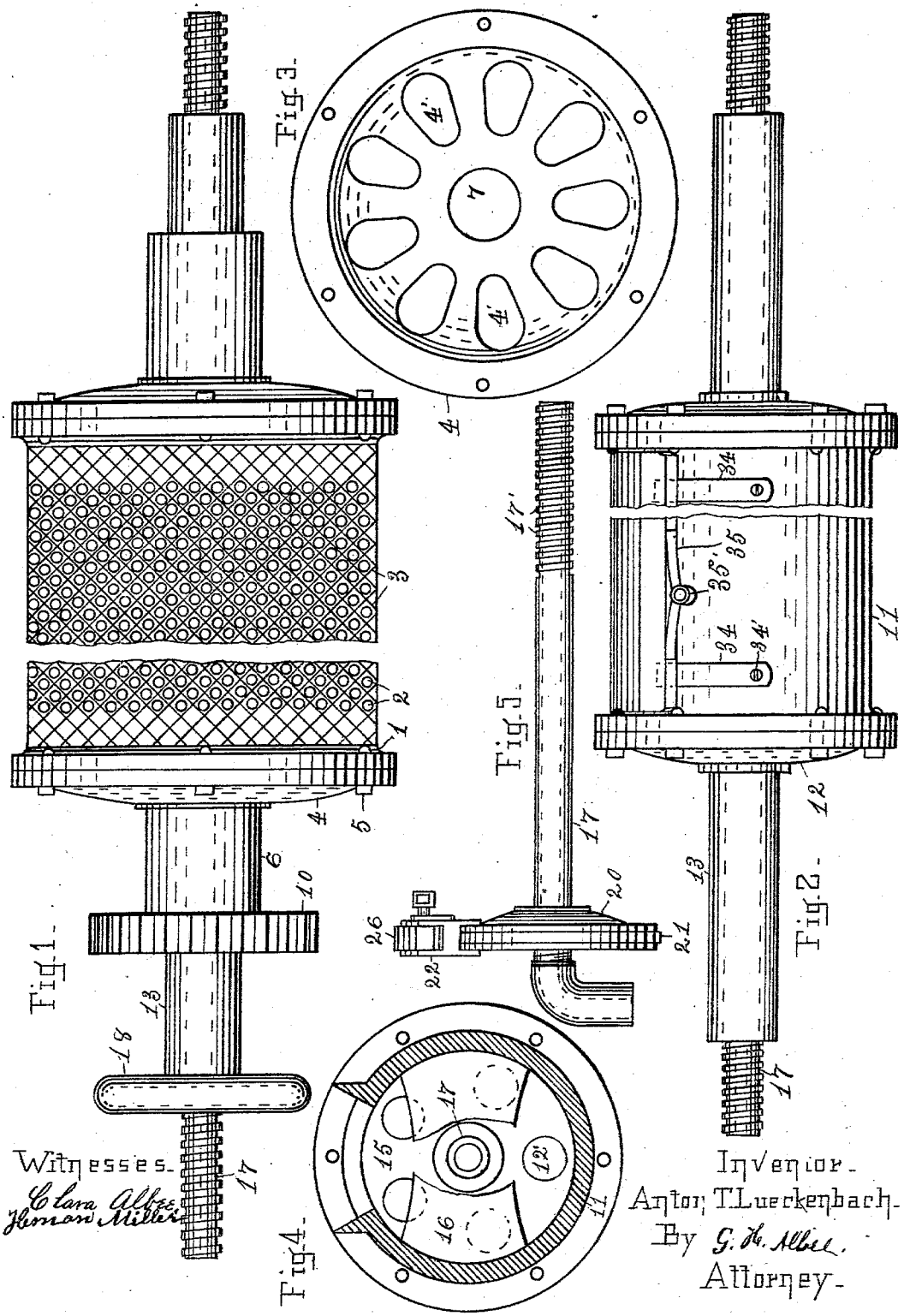
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(Application filed Mar. 25, 1902.)

(No Model.) 2 Sheets—Sheet 1.



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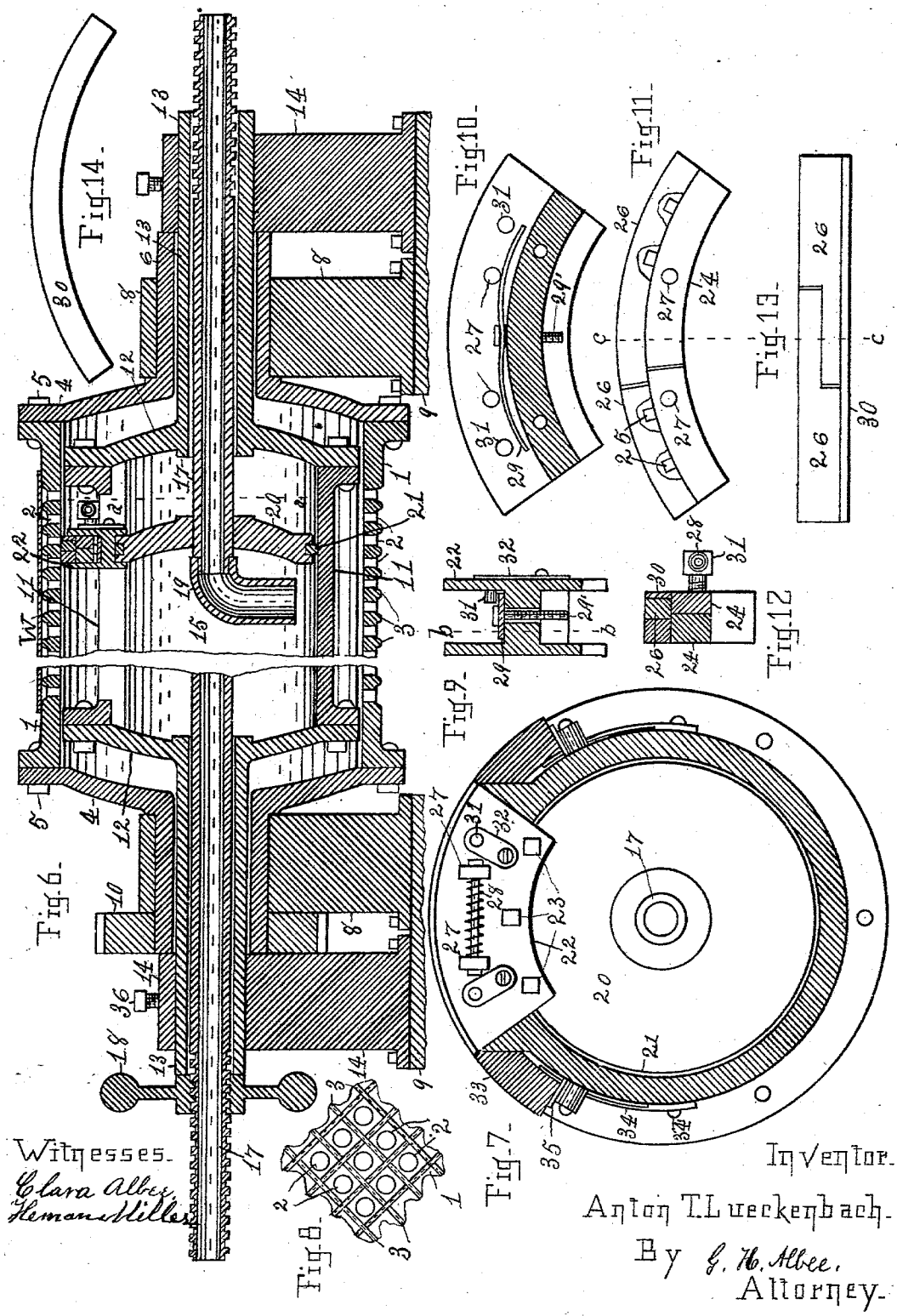
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UNITED STATES PATENT OFFICE.

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ROTARY SUCTION APPARATUS FOR PAPER-MACHINES.

SPECIFICATION forming part of Letters Patent No. 716,846, dated December 23, 1902.

Application filed March 25, 1902. Serial No. 99,863. (No model.)

To all whom it may concern:

Be it known that I, ANTON T. LUECKENBACH, a citizen of the United States, residing at Neenah, in the county of Winnebago and State of Wisconsin, have invented a new and useful Improvement in Rotary Suction Apparatus for Paper-Making Machines, of which the following is a specification.

My invention relates to a revolving hollow cylinder having its entire outer surface, which is intended to carry the paper-machine wire or felt, covered with wire-netting or otherwise provided with narrow ridges which are slightly elevated above the principal surface of the cylinder and form squares preferably diagonally arranged with a perforation to the interior of the cylinder in each square, said cylinder having a non-rotative suction-chamber arranged within it which is adapted for being connected with a suction pump or pumps; and the object of my improvement is to provide a suction apparatus for paper-making machines which will be effectual in its operation with the least possible wear to the paper-machine wire or felt, the mechanism for doing which is illustrated in the accompanying drawings, in which—

Figure 1 is a longitudinal side elevation of a portion of the two ends of the revolving cylinder and its suction-chamber within it, the surface of the cylinder intended for carrying the machine-wire being represented as a flat surface for the better showing of its covering of wire-netting and the perforations in the meshes of the netting. Fig. 2 is a longitudinal side elevation of portions of the two ends of the non-rotative suction-chamber. Fig. 3 is an end view of the outer cylinder with one of its end plates or heads removed and showing its interior. Fig. 4 is a transverse section of the suction-chamber about midway its length and showing its interior bracing, one head thereof, and a tubular piston-rod in the center of said head. Fig. 5 is a side elevation of the piston or follower for sliding along the suction-chamber for gaging the length along the chamber of the suction-surface under the machine-wire and the piston-rod with an elbow upon its inner end. Fig. 6 is a vertical section longitudinally of Fig. 1 with journal-bearings for the outer cylinder and supporting-stands for the suction-chamber. Fig. 7 is a transverse section of the suction-chamber upon the line *a a* of Fig. 6 as seen in looking toward the left. Fig. 8 is a plan showing a small section of the outer surface of the outer cylinder, its wire-netting over it, and holes in the squares of the netting. Figs. 9, 10, 11, 12, 13, and 14 are details showing the several parts of the sector-like attachment to the pistons for preventing the admission of unnecessary air to the suction-chamber. Fig. 9 is a vertical section transversely midway its length of said sector-like case or holder, as shown in Fig. 7, for containing packing-segments. Fig. 10 is a longitudinal section of said holder upon the line *b b* of Fig. 9 as it appears in looking toward the right. Fig. 11 is a side elevation of the packing-segments and their metallic supporting-segments. Fig. 12 is a vertical section of said packing-segments, their follower-segment, and their metallic supports for the packing and their follower-segment. Fig. 13 is a top view of the packing-segments and their follower-segment. Fig. 14 is a side elevation of said follower-segment. Figs. 1, 2, 3, 4, 5, and 6 are upon the same scale, Fig. 7 upon a larger scale, and the remaining figures upon a still larger one.

Similar numerals and letters indicate like parts in all of the views.

1 indicates the hollow perforated cylindrical shell of the apparatus; 2, perforations through said shell; 3, ridges formed by wire-netting or otherwise, which divide the surface of the outer cylinder into squares; *w*, the paper-machine wire or felt; 4, heads bolted to the shell 1 with bolts 5; 4′, apertures in the heads 4; 6, tubular journals integral with the heads, which form supports for the outer cylinder; 7, an aperture through each journal for the passage of tubular extensions upon the heads of the suction-chamber; 8, journal-bearings which are bolted upon the paper-machine frame and in which the outer cylinder is arranged to revolve; 10, a gear-wheel secured upon the outer end of one of the journals 6, by which the outer cylinder can be revolved; 11, the outer shell of the suction-chamber cylinder; 12, heads bolted upon said shell with bolts 5; 12′, apertures in said heads, which, with the apertures 4′, are for the admission of air to the interior of said

cylinders and also for lessening the weight of the heads; 13, tubular extensions of the heads 12, by which the suction-chamber is supported upon removable stands 14; 15, the suction-chamber; 16, a brace, of which there may be one or more arranged toward the middle of the length of said chamber for stiffening its outer wall; 17, tubular piston-rods which serve as suction-pipes, one to each piston, to the outer end of one or both of which a suction-pump is to be connected; 18, hand-wheels, one to each end, being threaded to engage the threads 17′ upon the rods 17, that upon the right-hand end being omitted in the several figures. 19 is an elbow upon the inner end of the piston-rod; 20, pistons fitted with rods 17 for longitudinal movement along the suction-chamber, they being adapted to be drawn inward by suction or pushed in by the operator and withdrawn by the turning of the hand-wheels 18; 21, a metallic packing-ring arranged in a groove around the piston-head, it being formed of resilient material for forming an air-tight joint around the piston in the circular part of its chamber; 22, a sector-like case or holder secured upon the piston with bolts 23 and being adapted to slide along the suction-chamber and nearly fill the space at the top of said chamber between the piston and the inside of the outer cylinder. 24 indicates metallic packing-segment holders, of which there are two to each sector-like case; 25, dowel-pins, which project from the upper surface of the pieces 24; 26, packing-segments mounted upon the packing-holders 24 and engaging the dowel-pins 25. These packing-segments should be of wood or of some material that will not cut or scratch the inside of the outer cylinder.

27 indicates bolts, which may be tapped into the holders 24, one to each piece, and a spring 28, arranged between said bolts, as shown in Fig. 7, for forcing the holders and their packing-segments outward against the sides of the opening at the top of the suction-chamber.

29 is a spring arranged within the holder 22 and may be bolted to the holder with bolt 29′. Said bolt can also extend down into the piston between the ends of the packing-ring 21, the purpose of said spring being to hold the packing-segments up against the interior of the outer cylinder; 30, a wood packing-segment follower arranged alongside of the segments 26 and against which the two spring-pressed pins 31 are arranged to bear and hold the segments 26 up against the inner wall of the case 22, while allowing for the swelling of the wood of said segments and their follower; 32, springs secured to the outside of the case 22 and having pins 31; 33, packing-strips, of wood or any suitable material, arranged along on opposite sides of the open space at the top of the chamber; 34 and 35, springs arranged to press upon the strips 33 and hold them up against the interior of the outer cylinder and against the walls of the suction-chamber upon opposite sides of its top opening, the former spring being secured to the outside of the suction-chamber with bolts 34′ and the latter with bolts 35′.

In forming the hollow outer cylinder and such parts of the suction apparatus as will be liable to be injuriously affected by the acids of the paper-stock they are to be made of brass or such metal as will be unaffected by said acids, the outer shell being turned off upon both its outer and inner surface.

An essential part of my invention is in the formation of the outer surface of the outer revolving cylinder, which is to be so formed that a series of narrow ridges, preferably slightly oval, somewhat similar to the surface of a semicircle of wire, if secured thereon, is formed upon the surface of said cylinder. Said ridges may be formed upon the surface of said cylinder in the metal of which it is composed or by applying a sheathing of wire-netting or perforated sheet metal by brazing or soldering said sheathing thereto in such a manner as to be integral with the material of the cylinder and so that the paper-machine wire or felt, whichever is to be used upon it, will be supported entirely upon said ridges, said ridges forming squares of a uniform diameter or mesh approximately three-eighths of an inch in diameter, and in the center of each square over such surface of said cylinder as will be subjected to the action of the suction apparatus contained by it a small perforation is to be made through to the interior of said cylinder, whereby the paper-machine wire or felt will be carried over the surface of the cylinder upon said ridges, and thereby present nearly the entire under surface of said wire or felt to the action of the suction apparatus connected with it.

The perforations in the squares may be slightly countersunk upon the outer surface of the cylinder, if desired. The outer cylinder is to be revolved in its journal-boxes 8 by suitable gearing engaging with the gear-wheel 10 at a speed corresponding upon its outer surface with the speed of travel of the paper-machine wire which is to be carried over its surface, said machine wire or felt, with the paper-pulp thereon, in its travel over the cylinder bearing upon the ridges which are formed by the wire-netting or otherwise, and thereby presenting almost the entire under surface of the machine-wire or such width as the deckle-straps are gaged for to be subjected to the action of the contained suction-chamber. Should these ridges be formed upon the outer surface of the outer cylinder by the application of a sheathing of wire-netting, the wires at the crossing, which form the meshes, should be so treated by solder or otherwise and by grinding down all slight inequalities as to present an even and smooth surface for carrying the machine-wire.

The suction-chamber consists of a cylin-

drical body of a length a little less than the length of the interior of the outer cylinder and of a circumference adapted for the interior of the outer cylinder open at its top, as shown in Figs. 4 and 6, and being bored to a circular form upon its inner surface and provided with packing-strips 33, which are arranged along on opposite sides of the opening in its top, and also with springs 34 and 35 for forcing said strips up against the edges of the openings in the top of the chamber and also against the inner surface of the outer cylinder.

Pistons 20 are arranged to slide along the chamber from each end toward the middle, a spring packing-ring 21 being inserted in a groove around each piston and a sector-like packing-holder 22 being secured to the upper edge of the pistons having packing-segment holders, with wood or other material suitably-formed packing-segments removably attached to said holders, springs 28 and 29 and also springs 32 being arranged for pressing said packing-holder and the packing-segments and their follower up against the interior of the outer cylinder and outward against the sides of the opening in the top of the suction-chamber. The pistons can be adjusted along the suction-chamber by means of the hand-wheels 18 for adapting the space between the pistons to the width of paper being made.

The several springs for forcing the packing strips and segments in the desired direction may be applied in other ways than is herein shown without departing from the principles of my invention.

In order to obtain access to the interior of the suction-chamber, the hand-wheels are to be removed, the connection with the suction pump or pumps broken, the outer cylinder properly blocked up, and the stands 8 and 14 removed, when the entire suction-chamber can be withdrawn. Any necessary adjustment and repairs can then be made and the chamber returned to its proper position and the necessary connections made.

By means of suitable rolls properly arranged the paper-machine wire or felt can be made to encircle the outer cylinder to any desired degree and the suction-chamber turned so as to bring the opening in its top properly under said wire, the area of said opening being made to correspond with the area upon said wire which it is desired to apply the suction to. The suction-chamber can be held in any desired circumferential position by means of set-screws 36 or otherwise in the stands 14.

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

1. In a suction apparatus for paper-making machines, a hollow cylinder having tubular extension supporting-heads upon which it is mounted for revolution in suitable bearings, and being provided with mechanism for revolving it at substantially the same outer-surface speed as that of the paper-machine wire or felt under which it is mounted, squares formed upon the outer surface of said cylinder which are separated from each other by slight ridges of sufficient prominence to support said paper-machine wire or felt substantially upon said ridges, each of said squares from the mid-length of said cylinder toward each end for the distance to which its suction is adapted to act being centrally bored to the interior of said cylinder, and a non-rotative suction-chamber adapted for being connected with a suction-pump arranged inside of said cylinder for drawing water from the paper-pulp on said paper-machine wire or felt through said bored apertures, substantially as described.

2. In a suction apparatus for paper-making machines, a hollow cylinder having tubular extension supporting-heads upon which it is mounted for revolution in suitable bearings, and being provided with mechanism for revolving it at substantially the same outer-surface speed as that of the paper-machine wire or felt under which it is mounted, the outer surface of said cylinder being covered with wire-netting of a suitable mesh secured tightly thereon, each square of said mesh from the mid-length of said cylinder toward each end for the distance to which its suction is adapted to act being centrally bored to the interior of said cylinder, and a non-rotative suction-chamber adapted for being connected with a suction-pump arranged inside of said cylinder for drawing water from the paper-pulp on said paper-machine wire or felt through said bored apertures, substantially as set forth.

3. In a suction apparatus for paper-making machines, a hollow cylinder having tubular extension supporting-heads upon which it is mounted for revolution in suitable bearings, and being provided with mechanism for revolving it at substantially the same outer-surface speed as that of the paper-machine wire or felt under which it is mounted, the outer surface of said cylinder being formed into squares separated from each other by slight ridges of sufficient prominence to support said paper-machine wire or felt substantially on said ridges, each of said squares from the mid-length of said cylinder toward each end for the distance to which its suction is adapted to act being bored to the interior of said cylinder, and a suction-chamber formed of a hollow cylindrical body, open upon its upper side for the greater part of its length, arranged inside of said perforated cylinder and being provided with heads having tubular extensions upon which said cylindrical body is supported in a fixed position, a piston arranged for longitudinal movement along said chamber, near each end thereof, each piston having means for producing said movement and one or both of them for forming a connection from the space between said

pistons to a suction-pump, a sector-like extension for excluding the entrance of air to said chamber mounted upon each piston, and suitable packing arranged around each piston, along the sides of the opening in the top of said chamber, between said sector-like extension and both the inside of the outer cylinder and the sides of said chamber, substantially as described.

4. In a suction apparatus for paper-making machines composed of a hollow cylinder, perforated through its outer shell and having tubular extension supporting-heads upon which it is mounted for revolution in suitable bearings, a non-rotative cylindrical-shaped suction-chamber arranged inside of said perforated cylinder having an opening along its upper side for a part of its length to the interior of said perforated cylinder and pistons arranged for longitudinal movement in said chamber, a sector-like extension for each piston consisting of the holder 22, each holder containing the segment-holders 24, having the dowel-pins 25, the packing-segments 26 and followers 30, the spring 28 and spring 29, substantially as described.

5. In a suction apparatus for paper-making machines composed of a hollow perforated cylinder having tubular extension supporting-heads upon which it is mounted for revolution in suitable bearings, and a non-rotative cylindrical-shaped suction-chamber arranged inside of said perforated cylinder having an opening along the principal portion of its upper side to the interior of said perforated cylinder, a packing-strip consisting of a non-rotating piece of suitable material arranged alongside of the opposite walls of said opening and suitable springs arranged for pressing said strips against the sides of said opening and against the inside surface of said perforated cylinder, substantially as set forth and shown.

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