Aug. 25, 1936. F. W. ROBERTS ET AL 2,052,541

CORE FOR PAPER ROLLS

Filed Dec. 12, 1933 2 Sheets-Sheet 1

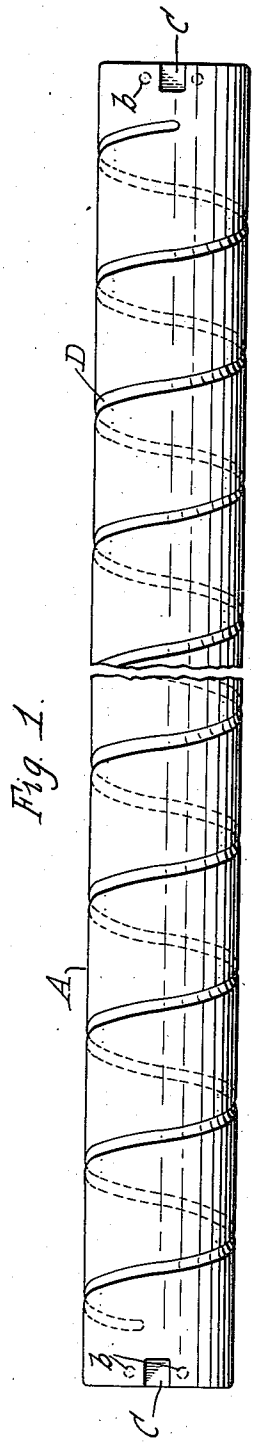

Fig. 1.

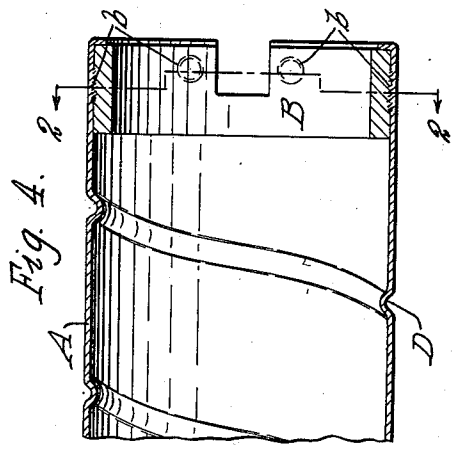

Fig. 4.

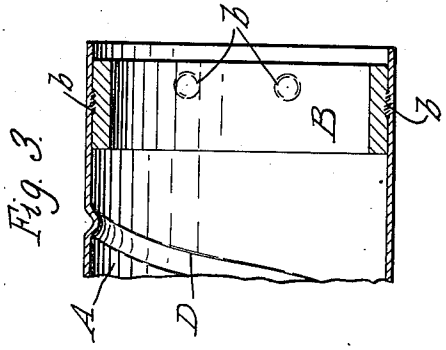

Fig. 3.

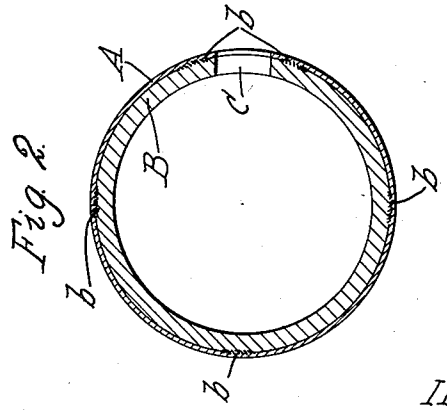

Fig. 2.

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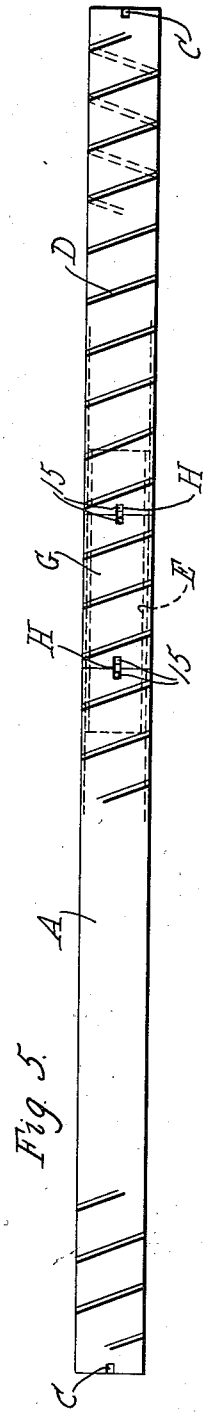

Fig. 5.

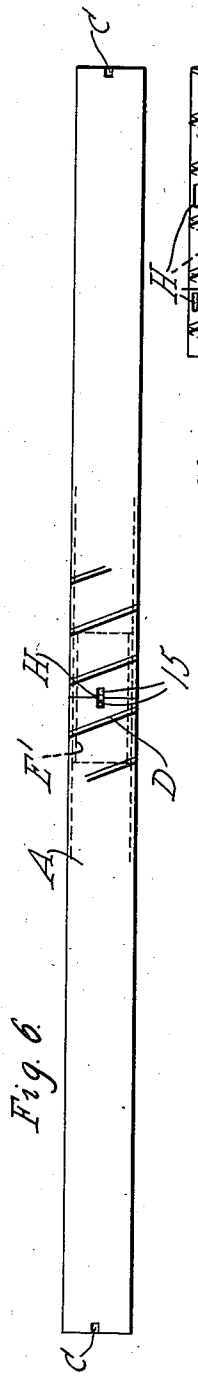

Fig. 6.

Fig. 7.

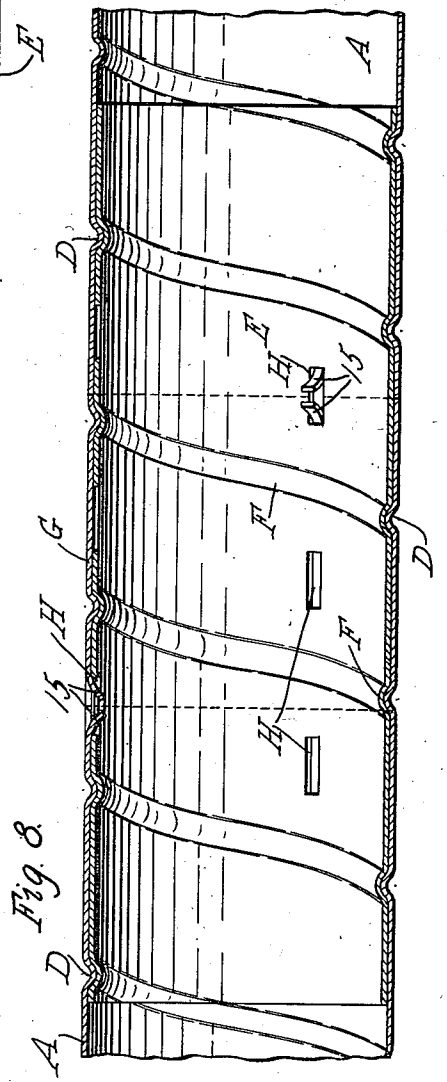

Fig. 8.

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CORE FOR PAPER ROLLS

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13 Claims. (Cl. 242—68)

This invention relates to improvements in cores of the kind on which paper is wound in paper mills and from which the paper is unwound at the printing presses.

Cores of this kind have heretofore generally been made of paper wound to produce a relatively thick cylinder or tube, the ends of which are reinforced by metal caps or end pieces which are adapted to cooperate with the winding mechanism of a paper mill and the unwinding mechanism on a printing press. These cores were used mainly because of their relatively light weight so that the cost of shipping cores back and forth between the paper mill and the printing establishment is reduced to a minimum. These paper cores, however, are objectionable since they are comparatively fragile so that considerable expense is necessary for the repairing and replacing of these cores, and furthermore, these paper cores are not rigid enough to maintain their shapes so that apparently the paper is not evenly or tightly wound thereon, and after most of the paper has been unwound from a roll, the remainder of the paper must be rewound on another core before it can be used in the printing press, since slack winding of the paper on the core renders it impossible to use this slack paper on the printing presses.

Tubular metal cores in the form of pipes or tubes of uniform thickness throughout have also heretofore been employed within the paper mills themselves where the paper is rewound from such core in the mill itself so that transportation costs do not enter into the problem. Such cores, however, are so heavy that the shipping of the same to and from the paper mill would result in prohibitive cost of transportation.

The objects of this invention are to construct a composite core made mainly of relatively thin metal and having a substantially uniform outside diameter for engagement with the paper at the interior of the roll and provided with reinforcing means at the opposite ends thereof; also to provide cores of this kind which are so constructed as to be capable of cooperating with the same arbors and driving members now commonly employed in paper mills and printing establishments in connection with paper cores; also to provide a core of this kind of greatly increased strength and durability without materially increasing the weight of the core beyond the weight of paper cores now in use; also to provide a core of this kind having certain deformations on the surface thereof which reinforce the thin metal portion of the core and at the same time facilitate the starting of the winding of the paper on the core; also to provide a core of this kind with means for readily repairing damaged portions of cores or for increasing or decreasing the length of cores; also to provide means for repairing or changing the length of cores which cooperate with the deformations on the core to form a secure joint; also to provide a core of this kind with a helical groove which reinforces the core and facilitates the winding of the paper thereon, and which makes it possible to provide a threaded engagement with parts that may be used for repairing or changing the length of cores; also to provide an improved method and apparatus for manufacturing cores of the kind described; also to improve cores of this kind in other respects hereinafter specified.

In the accompanying drawings:

Fig. 1 is a view, partly broken away, of a core for use on paper rolls and embodying this invention.

Fig. 2 is a transverse sectional view thereof, on line 2—2, Fig. 4.

Figs. 3 and 4 are fragmentary central longitudinal sectional views of the end of the core showing two steps in the operation of making the core.

Figs. 5 and 6 are longitudinal views of a core provided with means for repairing or changing the length of cores.

Fig. 7 is a longitudinal view of an inserted or inner member for use in repairing or changing the length of cores.

Fig. 8 is a longitudinal sectional view of the portion of the core, on an enlarged scale, having an insert therein for repairing or changing the length of a core.

The core is made of a thin metal body portion A, which extends throughout the length of the core and which may be formed of seamless tubing or of sheet metal welded or otherwise formed into a tube. The ends of the core are provided with suitable reinforcing portions of materially greater thickness, and in the construction shown by way of example, the reinforcement of the ends is effected by means of sleeves or collars B which are preferably made of steel or other hard and durable material. These collars are preferably made of such thickness that the inner face of each collar will cooperate with the arbors commonly employed in connection with the winding or unwinding of the paper cores. In the particular construction shown, the collars are arranged on the interior of the cores, and are secured in correct

relation to the ends of the core by means of spot welding, as indicated at *b*. It will be obvious that any means for securing the collars to the ends of the cores may be employed, and that, if desired, the ends of the cores may be contracted or reduced in diameter so that the collars can be secured to the outer surfaces of the ends of the cores. The collars, however, must be so secured to the tubes A that the core will be of uniform diameter throughout its length.

The cores must be of a length equal to the width of the paper wound on the same, and consequently, the length of the cores should be accurately controlled. We, consequently, provide means for accurately spacing the collars B relatively to each other and after the collars are welded in place as shown in Fig. 3, the ends of the tube A extending beyond the collars are turned over as indicated in Fig. 4. By this arrangement, slight differences in the length of cores will not be of consequence, since the ends are turned over so that differences in length do not affect the length of the cores.

After the collars have been secured to cores and the ends of the cores turned over, a key notch or recess C is preferably cut in one or both ends of the core for forming a driving connection with a winding or unwinding mechanism. Preferably two of the spot welded connections between the collar and the tube A are arranged so that one is at each side of the cut-out portion C.

While it is possible under some conditions to use a core with a smooth or unbroken cylindrical surface from end to end thereof, yet we have found that greatly improved results are obtained if the metal tube or shell A of the core is provided with more or less regular deformations or grooves, for the purposes of reinforcing the core, truing the same, and facilitating adhesion of the paper thereto during the start of the winding. Such grooves or deformations may be of any suitable or desired form, but should not be of a form to extend outwardly beyond the diameter of the core. Longitudinal grooves may be employed or grooves extending partly or entirely around the core. We have found that very satisfactory results can be obtained by using a spiral groove D which extends throughout the greater portion of the length of the core terminating short of the portions of the core on which the collars or sleeves B are secured. Such groove D may be of any suitable or desired cross sectional area, but preferably the groove is formed in such a way that it is not excessively wide across the outer face thereof. The spiral groove has a decided strengthening effect upon the core, and when starting to wind a sheet of paper on the core the tension of the paper causes the same to pull slightly into the groove and thus adhere firmly to the face of the core.

In cores of this kind as heretofore made of paper, it was only possible to repair cores, if the damaged part was located near the end of the core, in which case the core could be shortened for use on smaller rolls of paper, by cutting off the damaged part and placing a metal reinforcement on the end of the core thus formed. With our improved core, it is possible to repair damaged parts occurring on any portion of the core, and it is also possible to remove a damaged portion of a core and substitute for it a new part so that the repaired core will be of the same length as the original core. The manner in which this can be effected is shown in Figs. 5–8 inclusive, in which the tube A of the core can be cut at any portion thereof intermediate of the ends and the core can then be repaired by placing an inner member or insert E into the core. This inner member is preferably of an outer diameter very slightly less than the inner diameter of the tube A of the core, and is also provided with a groove or grooves F formed to correspond with the groove or grooves formed in the tube A. If spiral grooves are employed, the inner member can be secured within the tube A by using the grooves as screw threads and thus threading the inner member E into place within the outer member A until the inner or repair member overlaps both meeting ends of the outer tube A. It is also possible to cut a piece of outer tubing similar to the outer tube A of the desired length, either to replace a damaged part from a core or to lengthen the core to the desired extent, and a part G for this purpose is shown in Fig. 5. In this case, the insert member E is made of sufficient length so that when the spacing member G has been threaded in place thereon, the ends of the insert member E will extend into the opposite ends of the tube A to a sufficient extent to form a rigid connection therewith.

Any suitable means may be employed to rigidly secure the parts together. In the particular construction shown, this can be very easily accomplished by providing the inner member E with grooves or slots H arranged at intervals around the periphery of the inner member and any tubular portion of the core can then be interlocked with the inner member E by bending inwardly a tongue or lip cut from any portion of the outer tube adjacent to an end thereof, which can be easily done by a chisel or other implement such lips being shown at 15 in Fig. 8. These lips cooperate with the spiral grooves to securely hold the telescoping tubular parts in engagement by preventing turning of the tubular parts relatively to each other. By providing a series of these slots at intervals around the periphery as shown in Fig. 7, it is always possible to find a slot which either occurs at abutting ends of two outer tubular portions, or which can be placed at such abutting ends by a slight turning of the inner telescoping tube E. Any other means for forming a connection between tubular parts of the core may, however, be employed, if desired.

In Fig. 6 is shown a core in which a somewhat shorter inner member E′ is employed, as may be the case if no spacing portion G is used, as may for example be the case if a damaged portion of the tube is cut out without replacing such damaged portion by a tubular part, thus producing a shorter core, or the construction shown in Fig. 6 may be used, if it is desired to shorten a longer core. In this case, the two cut ends of the tube A are placed into engagement with the inner member E′, and lips or tongues 15 are then forced through apertures or slits in the insert or repair member E′. If it is desired to lengthen the core, it is merely necessary to cut the same crosswise and insert a member corresponding to the spacing member G of the desired length and then securing the parts together as shown in Figs. 5 and 8.

It is also possible in connection with our improved core to repeatedly change the length of cores, this being easily done by bending backwardly the lips or tongues 15 so that the parts of the core can again be separated by unscrewing. A repair part similar to the part G of different length can then be secured in place to form cores of the desired length. In paper mills where a larger number of cores are used, it is of great

importance to be able to change the length of cores, if the width of the sheets required by the consumer is changed.

If the cores are made without grooves, or with grooves of different shape or form, it will be obvious that the telescoping inner member can be changed to correspond to the shape of the cylindrical body portion of the core. Other means for securing the inner and outer tubes together can, of course, be used. The repair means described are simple and easy to use and repairs or changes of length of tubes can easily be made in a paper mill or plant equipped with only a few simple tools.

The provision of the spiral groove in the tube results in the truing of the tube, since after welding or other operations on the tubes, some of these tubes are sometimes slightly elliptical in cross section instead of being truly circular, but we have found that after a tube has been provided with a spiral groove, the tubes are of uniformly truly circular cross sectional shape. The forming of a groove in a tube also has a tendency to harden the metal, and the groove changes the cross section of the metal sufficiently to produce a reinforcing effect. The tubes thus formed, even though made of comparatively thin material, are well able to stand the strains to which they may be subjected in their ordinary use or during shipping, and are very much sturdier and last much longer than paper tubes heretofore used.

Cores made of thin sheet body tubes with reinforcing sleeves in the ends thereof in accordance with this invention have the important advantages that they are absolutely of uniform length and are not subject to change of length due to weather conditions or endwise pressure applied by winding or unwinding mechanisms, as is the case with paper cores. Furthermore, these tubes are of truly cylindrical outer contour so that slack winding of paper is eliminated and in the case of cores of this kind in actual use, all but the last four or five turns of paper on the core could be used in the printing presses because of the firm adhesion of the paper to the core. The cores therefore reduce to a minimum the "core waste" which the printers or publishers have heretofore encountered with paper cores. Owing to the sturdy nature of these cores, much less repair work is necessary on the same than in connection with paper cores, and the shipping cost of cores of this kind is in some cases equal to that of paper cores, or only very slightly in excess of the shipping cost of paper cores.

We claim as our invention:

1. A core for a paper roll for use in paper mills and on printing presses, including a cylindrical, single-walled body portion of relatively thin metal, reinforcing members secured to the ends of said body portions, the interior of said cylindrical body portion between said reinforcing members being substantially unobstructed, from end to end, a driving recess in a reinforcing member, and a helical groove depressed into the outer surface of said body portion and terminating at said reinforcing members, said groove deforming a relatively small portion of the cylindrical surface of said core, leaving the remainder of said cylindrical surface undeformed.

2. A core for a paper roll including a cylindrical, single-walled body portion made of thin sheet metal, reinforcing sleeves of greater length than radial thickness secured in said body portion at a slight distance from the ends thereof, the ends of said body portion being turned inwardly against the outer edges of said sleeves, and means attaching each sleeve directly to the body portion where abutting the sleeve to prevent endwise displacement of that sleeve along the body portion.

3. A core for a paper roll including a single-walled cylindrical body portion of thin metal open from end to end and having a helical groove extending approximately from end to end and spun into its outer surface to form an internal helical rib, said body portion being cut transversely of its length into a plurality of sections, a short inner tube of sufficient length to extend into the end portions of each section and also provided with a helical groove adapted for a threaded engagement with the helical rib on the interior of the body portion, and means for positively locking said inner tube against turning relatively to both of said sections, to prevent separation of the sections.

4. A core for a paper roll including a body portion of thin metal and comprising two sections, an inner tubular member of slightly smaller diameter than the inner diameter of said body portion and adapted to telescope into the opposite ends of said sections, a third section of tubing of the same diameter as said body portion and through which said inner tubular member may extend with its opposite ends projecting beyond the ends of said third section and which third section abuts against adjacent ends of the sections of said body portion when said opposite ends of said inner tubular member are telescoped into the ends of said body portion sections, and means for securing said inner tube to the sections of said body portion.

5. A core for a paper roll including a body portion of thin metal and provided with reinforcing grooves and cut transversely of its length intermediate of its ends, an inner tubular member adapted to fit into adjacent cut ends and provided with grooves adapted to engage with the grooves in said body portion, and a spacing member around said inner tube and adapted to abut against the cut ends of said body portion.

6. A core for a paper roll including a body portion of thin metal and provided with reinforcing grooves and cut transversely of its length intermediate of its ends, an inner tubular member adapted to fit into adjacent cut ends and provided with grooves adapted to engage with the grooves in said body portion, and a spacing member around said inner tube and adapted to abut against the cut ends of said body portion, said spacing member also being provided with grooves similar to the grooves in said body portion and cooperating with the grooves in said inner member to hold said spacing member against rotation relatively to said body portion and inner member.

7. A core for a paper roll including a body portion of thin metal having a spiral groove formed therein and cut transversely of its length intermediate of its ends into two sections, an inner tubular member adapted to fit into the adjacent cut ends of said body portion and provided with a spiral groove adapted to have a threaded engagement with the spiral groove of said body portion, a spacing member arranged about said inner member and abutting against the cut ends of said body portion, and means for locking said inner member to the two sections of said body portion.

8. A core for a paper roll including a body por-

tion of thin metal having a spiral groove formed therein and cut transversely of its length intermediate of its ends into two sections, an inner tubular member adapted to fit into the adjacent cut ends of said body portion and provided with a spiral groove adapted to have a threaded engagement with the spiral groove of said body portion, a spacing member arranged about said inner member and abutting against the cut ends of said body portion, said spacing member being provided with a spiral groove corresponding to the groove in said body portion and engaging with the groove of said inner member, and means for securing said inner member against rotation relatively to both sections of said body portion

9. A core for a paper roll for use in paper mills and on printing presses and comprising a single-walled pipe-like unitary body of thin metal coextensive with the length of the roll, and reinforcing rings of greater axial length than radial thickness and of a diameter not greater than the outside diameter of said body and secured in telescoping relation to the opposite ends of said body, the interior of said pipe-like body between said rings being open from end to end, said pipe-like body having a portion of its outside surface grooved at a plurality of zones that are substantially separated by ungrooved zones by which a paper sheet wound on said core will be caused by the grooved zones, to grip the core and will be held by the ungrooved zones against substantial deformation in a direction normal to the faces of the sheet.

10. A core for a paper roll for use in paper mills and on printing presses and comprising a single-walled pipe-like unitary body of thin metal coextensive with the length of the roll, and reinforcing rings secured to the ends of said body, said body having a helical groove formed in its outer surface progressing approximately from end to end, the greater portion of the outer surface of the core being of undeformed cylindrical form and a lesser portion thereof being deformed by said groove.

11. A core for a paper roll for use in paper mills and on printing presses and comprising a single-walled pipe-like unitary body of thin metal coextensive with the length of the roll, and reinforcing rings of substantial axial length secured to the ends of said body, said body being provided with a groove formed therein and progressing helically from end to end, said helical groove being of such pitch as to leave the greater portion of said core of undeformed cylindrical shape.

12. A core for a paper roll for use in paper mills and on printing presses and comprising a single-walled pipe-like unitary body of thin metal coextensive with the length of the roll and formed in two sections abutting end to end, each section having a helical groove spun into the wall thereof and progressing approximately from end to end of the core, an inner tubular member of slightly smaller diameter than the inner diameter of said body and adapted to telescope into the abutting ends of said sections and having a helical groove of the same size and pitch as said sections and which threads with the spun groove of the said sections, the interior of said core being substantially unobstructed, means for securing said inner member to both sections of said body, and reinforcing rings of substantial axial length, telescoping with and attached to the ends of said body.

13. A core for a paper roll and comprising a cylindrical body portion of thin metal open from end to end on its interior, and a bearing ring of substantial axial length anchored to each end of said body portion, said body portion having a helical groove in its outer cylindrical surface progressing approximately from end to end, with a space between adjacent turns of the groove greater than the width of the groove, to provide a smooth, ungrooved helical zone of substantial width between the adjacent turns of the groove.

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