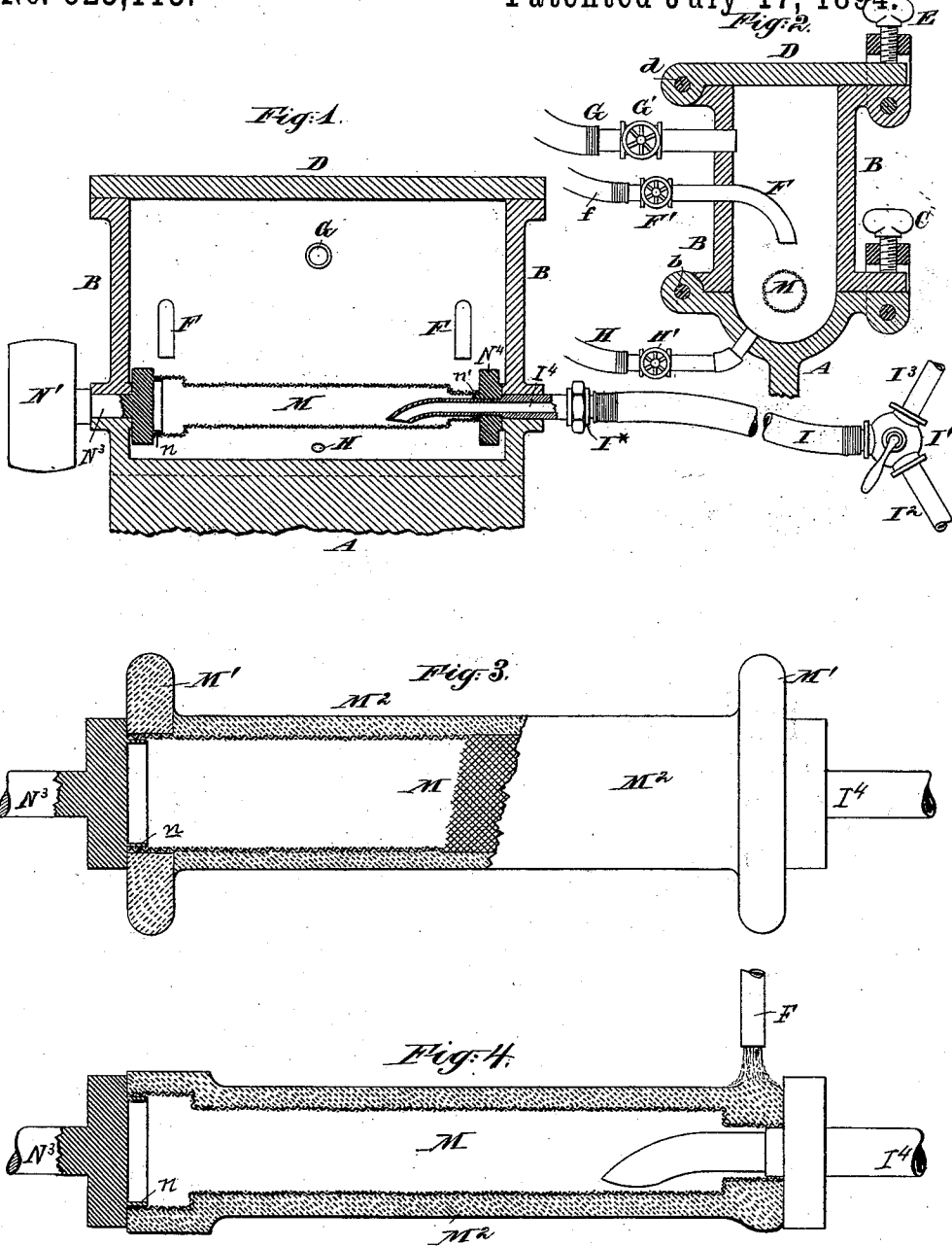


(No Model.)

H. FAIRBANKS & H. PARKER.
PROCESS OF AND MACHINE FOR MAKING SPOOLS OR HOLLOW
ARTICLES FROM PAPER STOCK.

No. 523,113.

Patented July 17, 1894.



Witnesses:

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UNITED STATES PATENT OFFICE.

HENRY FAIRBANKS AND HOWARD PARKER, OF ST. JOHNSBURY, VERMONT.

PROCESS OF AND MACHINE FOR MAKING SPOOLS OR HOLLOW ARTICLES FROM PAPER-STOCK.

SPECIFICATION forming part of Letters Patent No. 523,113, dated July 17, 1894.

Application filed March 2, 1888. Serial No. 265,962. (No model.)

To all whom it may concern:

Be it known that we, HENRY FAIRBANKS and HOWARD PARKER, of St. Johnsbury, Caledonia county, in the State of Vermont, have invented a certain new and useful Improvement in Processes of and Machines for Making Spools or Hollow Articles from Paper-Stock, of which the following is a specification.

Our invention includes apparatus for and process of depositing under pressure fibrous pulp from suspension upon the surface of a perforated form of the shape of the interior of the article to be produced, which form is placed just below the surface of thin pulp under air or steam pressure, which pressure is preferably aided by an exhaust through the exit pipe leading from the lowest part of the interior of the form or mold, while this form is slowly revolved, so as to bring each part of the thickened deposit successively above and below the lowering surface of the thin pulp which is pressed upon it, of which it takes up a lessening quantity as less and less of the water of suspension can be forced through into the interior, and by the partial drying and hardening forms a very firm body, which while wet prevents enough air to pass to materially reduce the effective pressure. When the surface of the thin pulp is so lowered as no longer to touch the partly formed body, a thin stream or streams of pulp are admitted, trickling upon parts of this body where additional thickness is required, and also flowing around and into the joint between this body and any previously molded piece which has been placed in position upon this body, and strongly and smoothly uniting both into one homogeneous structure.

We will describe the invention as applied to the production of bobbins such as are used at certain stages of the cotton and woolen manufacture.

We provide a set of hollow forms to shape the interior of the bobbins, and mount them successively on a hollow shaft equipped with means for revolving it and for maintaining a vacuum or partial vacuum in the interior. The form is inclosed in a casing, the lower portion of which may be permanent, but the upper portion is adapted to be readily opened and a liberal quantity of pulp is supplied to

cover the form. We provide for introducing air or steam under pressure into the casing to increase the force with which the pulp is driven inward upon the perforated form, the water flowing through the perforations and escaping from the lowest point of the interior through the hollow shaft while the fibers remain in an increasing thickness of partially hardened pulp upon the exterior.

Toward the close of the operation of forming a bobbin a small stream of pulp is directed through a pipe upon such portion or portions as shall require to be of extra thickness. When a sufficient quantity has been thus received and properly distributed upon the form the stream of pulp is cut off, the pressure of the air or steam is let off and the case is opened and the form with its thick coating of pulp removed and a fresh form supplied after which the case is again closed, a fresh quantity of pulp supplied and the operation is repeated.

In the manufacture of spools or analogous articles having flanges or rings which extend out to considerable distances we produce the rims or outer portions of the flanges or rings first by independent means as by molding and compressing paper stock. The rings being made of proper size with their inner edges roughened, are applied loosely in the proper positions on the form and the treatment hereinafter described being followed the pulp accumulates to form the body and also fills the joints under the rings and firmly cements the rings to the other portion.

The accompanying drawings form a part of this specification and represent what we consider the best means of carrying out the invention.

Figure 1 is a central vertical section of the apparatus. Fig. 2 is a transverse section of the same. Fig. 3 is a longitudinal section of the form partly in elevation on a larger scale showing a spool partially formed. Fig. 4 is a corresponding section showing a bobbin partially formed.

Similar letters of reference indicate corresponding parts in all the figures where they occur.

A is the fixed portion of the casing; B is the upper portion connected thereto by a hinge *b* and by strong fastening screws C.

The top is closed by a cover D, connected to the portion B by a hinge *d* and screws or other efficient locking means E. A pipe F and hose *f* bring pulp from a pump or other supplying means not fully represented, and lead in through the side of the portion B of the vessel, its open end standing just above that portion of the bobbin which requires to be of extra thickness. There are two such pipes adapted to make two places of extra thickness. A nozzle connecting by a hose and pipe G with a reservoir of compressed air, or with a steam boiler provides for inducing a strong pressure on the fluid pulp contained in the vessel.

H is a pipe connected to supply pulp from a reservoir at a moderate elevation, not shown.

M is one of a series of perforated forms of wire gauze or other material adapted to shape the interior of the bobbin.

I⁴ is a tube extending into the casing and into the form M, and at the opposite side of the casing is a shaft N³ mounted in suitable bearings therein and provided with a pulley N', by which it is slowly rotated by a belt not shown. This shaft N³ is provided upon its inner end with a collar *n*, and upon the tube I⁴ within the casing is a sleeve N⁴ which is free to revolve thereon and is provided with a collar *n'*; on these collars *n* and *n'* the ends of the form are fitted.

The forms M may be attached and detached from the end of the hollow shaft within the casing A, B.

The provisions for introducing air or steam at a suitable pressure through the pipe G, the means for supplying pulp at a somewhat higher pressure through the pipes F, means for supplying pulp at ordinary pressures through the passage H, and the means for taking away the water, air or other fluids which penetrate to the space in the interior of the perforated form M through a suitable pipe I having a cock I' connected by a stuffing box I* to the hollow form M and maintaining a strong vacuum therein, may be of any ordinary or suitable character and need not be specially described. Stop-cocks F' G' and H' control the several passages.

In the use of the apparatus the fastenings C being detached the upper portion B of the casing is lifted by turning on its hinges *b*, the loaded form is removed by lifting it with its connected tube I⁴ and pulley N', out of the bearings in the fixed portion A of the casing these bearings having been removed by the lifting of the upper part B of the casing. When thus lifted the tube and pulley N' may be easily disconnected by an endwise movement. Next the hollow tube I⁴ may be removed by an endwise and slightly curved movement from the other end, after which a fresh form is applied by reversing these movements, and it, with its connected parts, I⁴ and N' being again set properly in the bearings in the part A, the upper portion B of the casing is again brought into its closed position

and secured by the screws C. Fluid pulp is now admitted through the passage H in sufficient quantities to cover the form by opening the cock H', after which it is again closed and the cocks F' I' and G' are opened and a vacuum produced in the form and the pulp is subjected to a strong pressure. Thus conditioned the form is slowly rotated by the action of a belt not shown running on the pulley N', and driven by any convenient power. The solid portion of the pulp accumulates upon the exterior of the form while the water strains through and is drawn out through the hollow tube I⁴. When the level of the thin pulp in the case A B has sunk so that the fibrous deposit upon the mold or form no longer dips in it, the vacuum still being maintained by the active working of the pump or other device, not shown, a small stream of pulp is admitted through each pipe F and trickles upon a portion of the form on which the bobbin requires to be of extra thickness. The material thus applied accumulates in an increasing thickness on that portion and after a sufficient time the operation may be suspended, the cocks F' and G' closed and the cock H' opened. This latter movement causes the pulp in the vessel A to be driven out through pipe H, into the supply reservoir not shown, keeping the pulp from settling, and relieving the air pressure. The attendant now liberates and removes the loaded form and substitutes another as above described, and re-secures the parts. Now the cock H' is closed and the cocks F' and G' are successively opened, the three-way cock I' is also turned in the position to connect the interior of form M with the suction end of the connected pump and a strong vacuum is again produced and maintained in the interior of form M, the pulp again accumulates on the exterior of the form, its watery portion being drawn inward and removed through the pipe I and the entire operation is again repeated.

Each thickly covered form removed is subsequently inclosed in dies which solidify and shape the pulp around it, and on drawing out the form the bobbin may be finished in a lathe and treated with varnish or other hardening material, or may be used without such treatment.

In Fig. 3, M' is the previously formed ring and M² the body formed and united thereto. The exterior of the spool is finally shaped and the body hardened by dies and the form drawn out from the interior in the same manner as has been above described for the completion of the bobbin.

Fig. 4 shows the manufacture of a bobbin. This is without any previously formed rings, but one of the pipes F is used to supply pulp at a late stage to induce an extra thickness on a portion as shown.

We can use the method described of producing an extra thick deposit wherever desired by directing a stream of liquid pulp to those points in connection with a stationary

form, through the perforations of which air or steam is pressed, and in this way the chine of a pail or the bosses on the bottom of a pan may be formed; and this improvement in the manufacture may be applied to many articles of paper pulp.

The rotary form and connections as described may be used for the manufacture of larger articles or smaller, such as pails, cylinders, water pipes, &c. We can use the method of applying previously molded parts in attaching ornaments, and also in making drinking cups with handles.

We are aware that it is common to use air pressure to increase the deposit of fibrous pulp upon forms with foraminous surfaces through which the water of suspension is pressed, and we do not claim this process or apparatus. But we employ a hollow form revolving upon a nearly horizontal axis in a case containing thin pulp, and so placed that, before the passage of the water is much checked by the layer of deposited pulp, the surface of the fluid is lowered so much that it no longer covers the form, and the rotation of that form carries successively all parts of the pulp deposit above that surface, to be hardened in passing and brought into condition to receive the next layer, which layer in turn is dried to receive the next. In this process, the lowered surface of the thin pulp covers less and less of the form, and the thickened body of pulp upon the form is more exposed to the drying pressure, until it no longer touches the fluid below. If then it is desired to add to the thickness of this body in any part, thin pulp is allowed to run slowly upon that part, building up a limited portion as the water is forced through, and the fibers are deposited. Parts already formed may be attached to the article which is forming, and made structurally one with it by flowing thin pulp into and around the joint, while the whole is subjected to the air or steam pressure. These processes are believed to be new.

We claim as our invention—

1. In a machine for making spools and hollow articles from paper stock, the pipe F, and connections for supplying fluid pulp under suitable pressure, and discharging the same at any point where a specially thick deposit of pulp over a limited surface is required, in combination with a perforated form, and an inclosing case, and with suitable air connections adapted to press the said pulp strongly against said form, substantially as herein specified.

2. In the art of manufacturing spools and hollow articles from paper stock, the process described of depositing from fluid pulp successive layers upon a foraminous mold of the form required for the interior of the article, by means of air-pressure forcing inward the water of suspension and removing it from within, and revolving the mold so as to bring each portion of its surface alternately into the fluid pulp to receive a layer of pulp, and into the air current to dry the same, and at the same time gradually lowering the surface of this fluid pulp, as the thickened deposit impedes more and more the passage of the water, so that the outer portion is not less dense than the inner, substantially as herein set forth.

3. In the art of manufacturing spools and hollow articles from paper stock, the process described of depositing successive layers upon a foraminous mold revolved in thin pulp, of which the surface is constantly lowered, thereby allowing each portion of the forming body to remain longer above the surface, exposed to the hardening effect of the air current, and when the fluid has sunk so as to no longer touch this body, continuing the process of building it up by directing a stream of the same pulp upon any part of the body where greater thickness is required, substantially as set forth.

4. In the art of manufacturing spools and other articles from paper stock, the process described of forming upon a foraminous mold revolved under air pressure at and above a gradually lowering surface of fluid pulp, a body of fibrous pulp, which as it thickens with each revolution is less submerged and more exposed to the drying air current, applying to this body a previously molded piece of partially dried pulp, and continuing the process of building up the revolving body by flowing over any part of it, and into and around the joining with the previously formed piece more thin pulp, thus cementing and making structurally one the forming body and the previously formed body, as a ring or flange upon the cylindrical body, as herein fully set forth.

In testimony whereof we have hereunto set our hands, at St. Johnsbury, Vermont, this 21st day of January, 1888, in the presence of two subscribing witnesses.

HENRY FAIRBANKS.
HOWARD PARKER.

Witnesses:

C. M. SPENCER,
C. V. PERRY.