G. L. RICE.

COMBINATION PAPER AND FIBER TWINE.

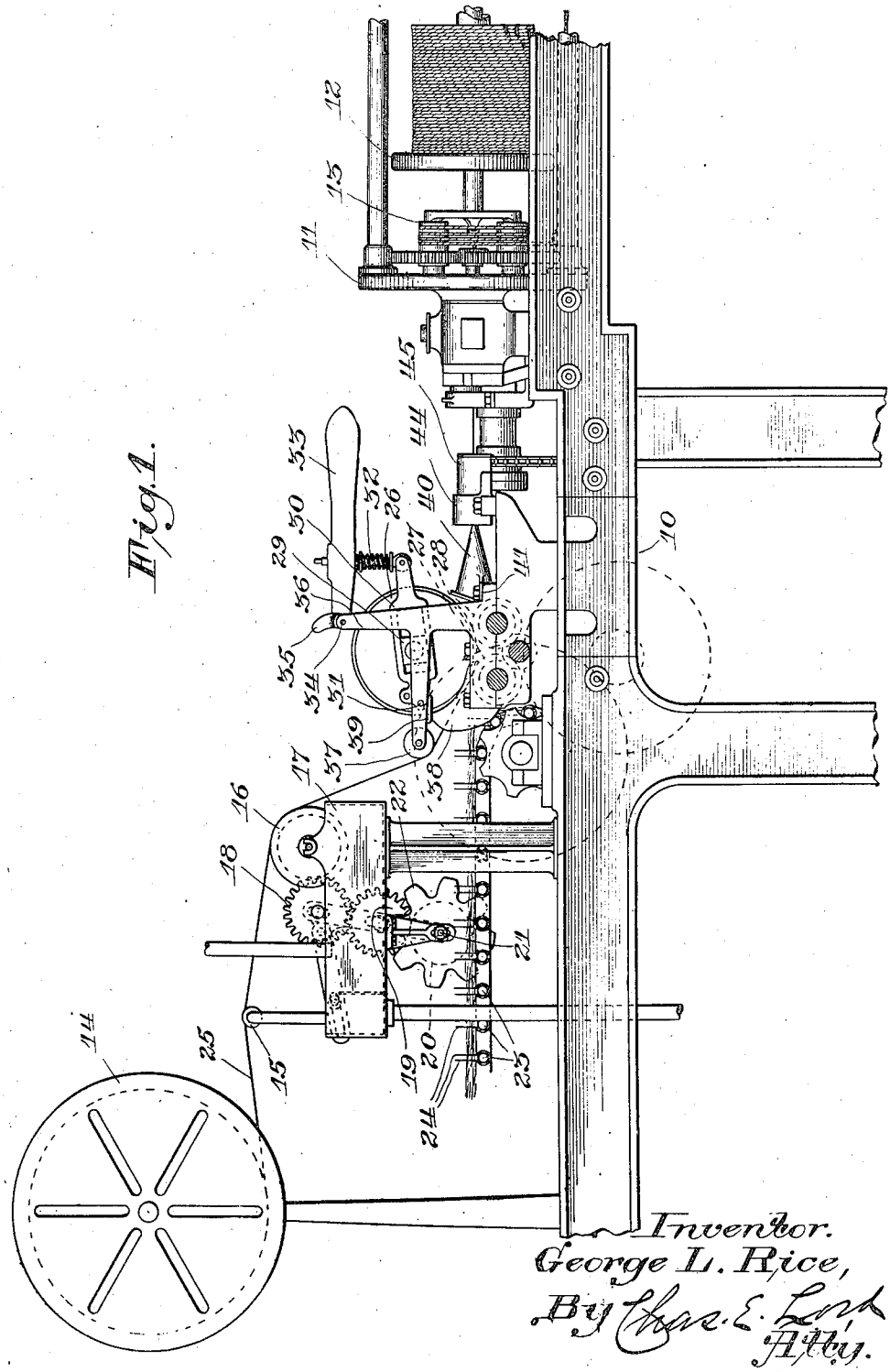
APPLICATION FILED NOV. 8, 1917.

1,320,920.

Patented Nov. 4, 1919.

2 SHEETS—SHEET 1.

Fig. 1.



Inventor.
George L. Rice,
By Chas. E. Lord
Atty.

G. L. RICE.

COMBINATION PAPER AND FIBER TWINE.

APPLICATION FILED NOV. 8, 1917.

1,320,920.

Patented Nov. 4, 1919.

2 SHEETS—SHEET 2.

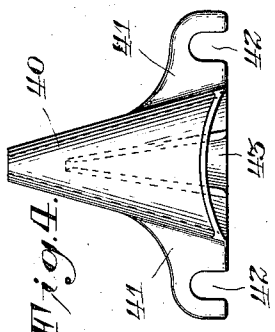


Fig. 4.

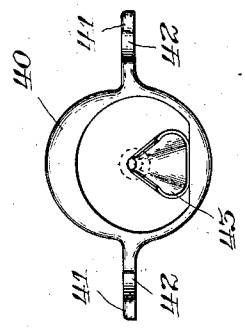


Fig. 5.

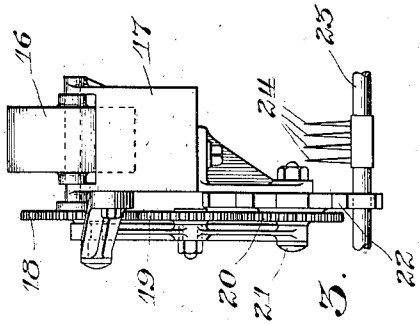


Fig. 3.

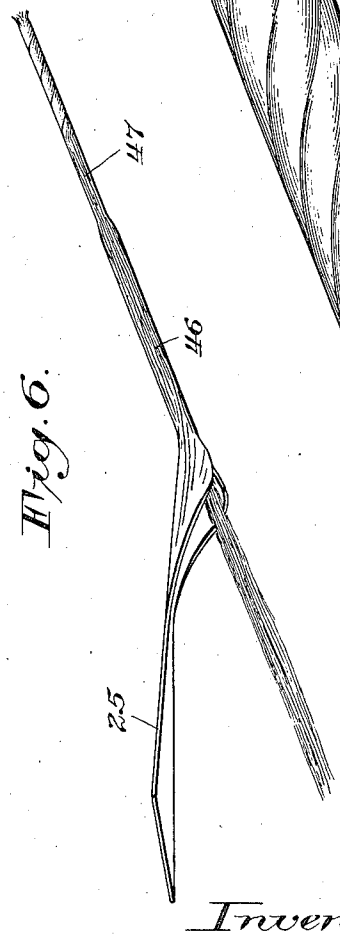


Fig. 6.

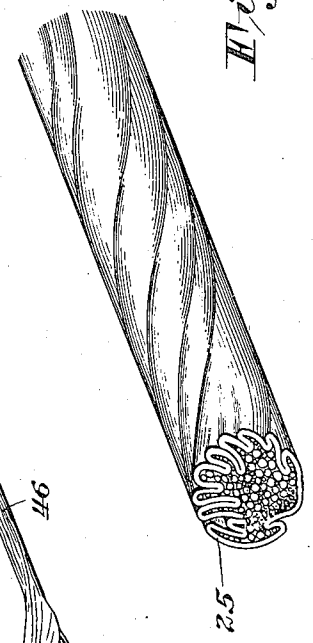


Fig. 7.

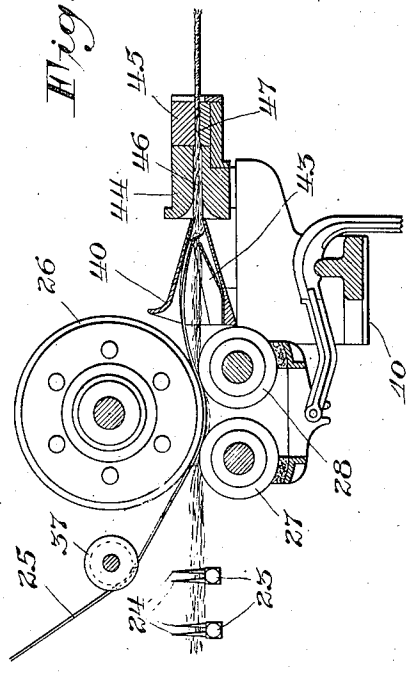


Fig. 2.

Inventor.
George L. Rice,
By Chas. E. Lord,
Attn.

UNITED STATES PATENT OFFICE.

GEORGE L. RICE, OF CHICAGO, ILLINOIS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO INTERNATIONAL HARVESTER COMPANY, A CORPORATION OF NEW JERSEY.

COMBINATION PAPER AND FIBER TWINE.

1,320,920. Specification of Letters Patent. Patented Nov. 4, 1919.

Application filed November 8, 1917. Serial No. 200,896.

To all whom it may concern:

Be it known that I, GEORGE L. RICE, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Combination Paper and Fiber Twine, of which the following is a full, clear, and exact specification.

My invention relates to paper twine, and more particularly to that form of paper twine made up of a combination of paper and fiber, and to methods of making the same.

I am well aware that there are many twines of this general type on the market which are made by covering a fiber center with paper, but in all cases the fiber center is spun into a yarn previous to covering the same with the paper. In other words, the spinning of the fiber center and the combining of the fiber with the paper are two separate and distinct operations. When the spun center and paper are being put together in this manner the tension on each is separately regulated, and the number of twists in the fiber center is entirely independent of and usually differs from the number of twists in the paper covering or sheath. The twine made in this manner is defective since there is no intertwisting or interlocking of the fiber and the paper, and the paper covering is, therefore, easily stripped from the fiber center. Moreover, the difference in the number of twists per unit of length in the fiber center and paper cover, and the fact that the fiber center, having previously been twisted into a twine, receives additional twist when the paper cover is applied, results in a twine which is stiff and kinky, and unsuitable when employed in such manner that it must be fed through guiding eyes or employed in binding and knotting machines.

The object of my invention is to provide a strong and flexible paper fiber twine having sufficient weather proofing and insect proofing qualities to meet the ordinary conditions, and more particularly the conditions encountered in the use of such twine in harvesting machinery, and moreover to provide a twine which will not kink and in the use of which the paper covering will not be stripped from the fiber.

With the above object in view my invention is embodied in a novel combination paper fiber twine in which the elements are interlocked and intertwisted, and in a method of making this novel twine.

The method of forming the twine will be hereinafter more fully disclosed, but may be briefly described as including the following steps, namely feeding the paper ribbon and untwisted fiber, wrapping the paper about the fiber, and twisting the elements together, preferably in such a manner as to dispose portions of the fiber in the longitudinal creases or crimps in the paper which may be formed in the paper feeding and wrapping operation.

The machine utilized in this instance for carrying out my improved method comprises means for feeding the paper and non-twisted fiber, means for folding the paper about the fiber, preferably in such a manner that portions of the fiber will be disposed in the longitudinal creases which may be formed by the paper feeding and folding means, and means for spinning or twisting the paper and fiber together. The machine and method form the subject matter of my divisional application, Serial Number 228,494, filed April 13, 1918.

In a more specific form the machine may embody the elements enumerated below, although it should be distinctly understood that all of these elements are not essential to the successful operation of the machine, and that my method may be carried out by other means than those comprising the machine illustrated and described in the specification.

The machine, in its more specific form, then, embodies means for simultaneously drawing and feeding untwisted fiber and a ribbon of paper, means for slightly condensing the fiber into a loose core and for forming the paper into a tube around this core, means for crushing or crimping the paper onto the loose fiber core in such a manner that some of the fibers of the loose core are disposed in the longitudinal seams formed by the crushing means, and means for simultaneously twisting the non-twisted fiber and crimped paper together to form the combination paper and fiber twine in which the paper covering is interlocked and intertwisted with the fiber core.

In the accompanying drawings I have

illustrated one embodiment of my invention, and in these drawings,—

Figure 1 shows a side elevation of the improved paper twine machine;

Fig. 2 shows an enlarged detail view, partly in section, of the feeding, forming and crushing mechanism;

Fig. 3 shows a front elevation of the moistening mechanism for the paper, and of the positive driving mechanism for the moistening roll;

Fig. 4 is a top plan view of the former;

Fig. 5 is a front elevation of the construction shown in Fig. 4;

Fig. 6 illustrates one step in the method of forming the twine; and,

Fig. 7 is a perspective showing the twine formed by my improved method and machine.

The usual type of horizontal flier spinning machine is employed, and this machine embodies a supporting frame 10, the usual flier frame 11, bobbin 12, and capstan pulleys 13. The paper is carried on a reel 14, supported by the main frame, and passes over an idler pulley 15 and a moistening roller 16, which are supported by the supply tank 17 for the moistening liquid. The roller 16 is positively driven by means of the gearing 18, 19 and 20, the gear 20 being mounted on a pintle 21, which also carries a sprocket 22, which meshes with the feeding mechanism for the sliver. This feeding mechanism for the fiber comprises the usual gill bars 23 and gill pins 24, driven in the usual manner. By means of this sprocket 22, and the intermediate gearing which is supported by the tank 17, I have provided a positive drive for the moistening roller 16, and in this manner the amount of moisture fed to the paper strip 25 can be positively controlled. The liquid in the tank 17 may consist simply of water, or an emulsion of water and oil, preferably animal or mineral oil, with which the paper may be treated to make it weather proof and insect proof. It is, however, not absolutely essential that the paper be treated with oil since the fiber is always treated with oil, and the intertwisting of the fiber and paper forces and squeezes the oil outwardly into the paper.

The feeding and drawing mechanism for the ribbon of paper and the sliver is substantially the same as that shown in my patent, No. 1,217,067, granted February 20, 1917, and consists of a large feeding roller 26 mounted above two small feeding rollers 27 and 28, the rollers 27 and 28 being positively driven by suitable gearing mechanism. The shaft for the roller 26 is journaled in a box 29, slidable in a supporting bracket 30, pivoted at 31 to a fixed part of the frame. I have provided suitable means by which the roller 26 may be lifted out of contact with the rollers 27 and 28, and this means comprises a link 32 suitably pivoted to a handle or lever 33, which in turn is pivoted at 34 to a fixed part of the frame. When it is desired to obtain access to the feeding rollers the arm 33 is lifted and swung about the pivot 34 until the stop 35 contacts with a portion 36 of the main frame, thereby raising the roller 26.

The ribbon 25 of paper after leaving the moistening roller 16 passes around an idler 37 carried by the main frame, and through a suitable guide 38, which rests on the roller 27 and is supported at its upper end by a lug 39 carried by the main frame.

From the above description it will be seen that the flat paper ribbon and the non-twisted sliver are positively and simultaneously fed through the machine, the rollers 26, 27 and 28 having the same drawing action described and claimed in my patent No. 1,217,067 above referred to. In this case, however, the paper and fiber are both fed by the feeding rollers, the upper roller contacting with the paper and the lower rollers engaging the fiber, the paper and fiber being in contact with each other as they pass between the feeding rollers. By means of this simultaneous feeding the tension on the paper and the sliver is maintained uniform, and this is a distinct advantage in that it avoids any tendency in the completed paper twine to break through unequal strains. After passing through the feeding rollers 26, 27 and 28 the paper ribbon and the loose fiber core are passed through a former 40, the main body portion of this former having the shape of a hollow cone. This conical body portion is provided with laterally projecting lugs 41, having slots 42, which are provided with suitable securing means for clamping the former to the frame of the spinning machine. On the inside of this conical body there is secured a guide 43 for the non-twisted fiber, this guide consisting of a grooved or concave member, the side walls of which converge toward the front of the cone for the purpose of condensing the sliver.

From an inspection of Fig. 2 it will be seen that the front end of this member 43 is disposed substantially in a line with the contacting surfaces of the feed rollers 26, 27 and 28, so that the sliver is not deflected materially out of the plane in which it is fed to the former. The paper after it leaves the feed rollers, as is clearly shown in Fig. 2, is positively fed into the former and contacts with the upper wall of the conical body portion, and this wall forms the flat ribbon into a tube, as illustrated in Fig. 6. This tube is wrapped around the loose fiber core and is crimped into longitudinal folds or creases

46, and the tube and the core are simultaneously fed forward to a crusher 44 and nipper 45, similar to the corresponding members shown in my patent above referred to. By means of the crusher and nipper the tube is further crimped and crushed on to the fiber, as shown at 47 in Fig. 6, and the fiber is forced into the creases of the paper. The nipper 45 further condenses and compresses the tube and loose fiber core, interlocks the paper and fiber, as is shown in Figs. 2 and 6, and upon leaving the nipper the paper and fiber are twisted together, forming the combination paper twine illustrated in perspective in Fig. 7.

It is important to note that neither the fiber nor the paper is twisted separately, and that substantially no twisting action takes place until the fiber and paper have been crushed together and leave the nipper 45, when the two elements are simultaneously twisted together, and in this way a twine is provided in which the two elements are simultaneously twisted together, thereby forming a twine in which the two elements making up the same have the same number of twists per unit of length. By means of this simultaneous feeding the tension on the paper and fiber is maintained uniform, and this is a distinct advantage in that it avoids any tendency in the completed twine to break through unequal strains, and also aids in interlocking the inner fiber core and paper covering together. Moreover, by twisting the two elements together simultaneously, forming a unitary structure, I have also succeeded in producing a twine, the elements of which will not be separated from each other by stripping even when the twine is subjected to severe and unusual use.

While I have, in this application, disclosed one embodiment which my invention may assume, it should be understood that the invention is capable of many modifications, and that such modifications may be employed without departing from the spirit and scope of my invention, as expressed in the following claims.

What I claim as new is:

1. A twine formed of a combination of fiber and paper twisted together to form a unitary structure with the paper covering the fiber and crimped into the fiber.

2. A twine formed of a combination paper and fiber, crimped and twisted together and having the paper entirely inclosing the fiber.

3. A twine formed of a combination of paper and fiber twisted together, and having the paper crimped into the fiber.

4. A twine formed of a combination of paper and fiber twisted together and in which the paper is longitudinally creased, and a portion of the fiber is disposed in the creases.

5. A twine formed of a combination of paper and fiber twisted together and in which the paper is longitudinally creased and wrapped about the fiber and a portion of the fiber is disposed within the creases of the paper.

6. A twine formed of a combination of paper and fiber, each having the same number of twists per unit of length, said paper covering the fiber and having a series of spiral folds therein, portions of said fiber being gripped in said folds.

7. A twine formed of a combination of paper and fiber twisted together, said paper having inwardly projecting portions, certain of the individual fibers being gripped between the inwardly projecting portions of said paper.

8. A twine formed of a combination of paper and fiber twisted together and having the paper entirely covering the fiber, said paper having inwardly projecting folds which grip certain of the fibers disposed between adjacent folds.

In testimony whereof I affix my signature.

GEORGE L. RICE.