No. 652,299. Patented June 26, 1900.

F. C. SMITH.

HOSE.

(Application filed Mar. 12, 1900.)

(No Model.)

FIG. 1.

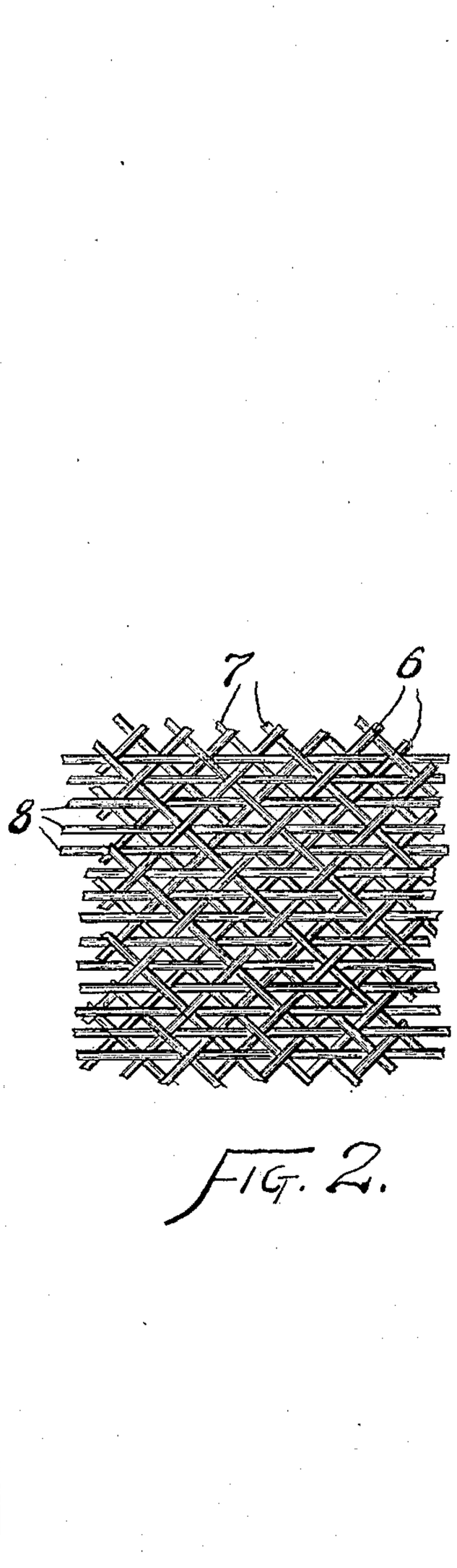

FIG. 2.

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UNITED STATES PATENT OFFICE.

FRANK C. SMITH, OF DELAWARE, OHIO.

HOSE.

SPECIFICATION forming part of Letters Patent No. 652,299, dated June 26, 1900.

Application filed March 12, 1900. Serial No. 8,309. (No model.)

To all whom it may concern:

Be it known that I, FRANK C. SMITH, a citizen of the United States, residing at Delaware, Delaware county, Ohio, (post-office address, No. 78 Lincoln avenue, Delaware, Ohio,) have invented certain new and useful Improvements in Hose, of which the following is a specification.

This invention, pertaining to improvements in hose, will be readily understood from the following description, taken in connection with the accompanying drawings, in which—

Figure 1 is a side elevation of a piece of air-brake hose exemplifying my invention, portions of the several members of the structure being successively removed to show the construction; and Fig. 2, a face view of a fabric member, illustrating a modification of the construction.

Air-brake hose is subjected to very peculiar duty, and numerous attempts have been made to satisfy the exacting conditions of air-brake use, in which the requirements are strength, flexibility, and durability. Ordinary hose, no matter how strong it may be, is quite unsatisfactory for air-brake purposes on account of its lack of flexibility, and when improvements in construction have resulted in the desired degree of flexibility there is too often a serious sacrifice of strength and durability. Air-brake hose is tested by being put into a kinking-machine and subjected to a great number of flexations. Hose of great strength; but involving square-woven canvas as the strengthening element, may give out after a short test in the kinking-machine. Hose having its fabric of diagonal weave may stand a million kinks in the testing-machine and show satisfactory flexibility; but there is a lack of tangential strength, and such hose may enlarge a quarter of an inch or more in diameter when subjected for hours to the heavy pressures of practice. If an attempt be made to secure the desired tangential strength by a circumferential winding of the inner rubber tube, in conjunction with the diagonal-woven fabric, the strength and flexibility are satisfactory, but the durability test fails, owing to the cutting of the rubber tube by the circumferential winding. If an attempt be made to guard the inner rubber tube by means of longitudinal strands, as has been proposed, these longitudinal strands will be found to increase the difficulty, for in the bending of such a tube the strands at the exterior of the bend, being under tension, enforce the crinkling of the inner part of the bend and the slacking of the longitudinal strands at that portion of the bend, the strands at the inner portion of the bend separating and overlapping and when the tube straightens cutting into the wrinkled surface of the tube. In my improved hose I secure the maximum of flexibility and of strength without sacrifice of high durability.

In the drawings, ignoring Fig. 2 for the present, 1 indicates the usual rubber inner tube; 2, a jacket thereon formed of fabric with its warp and woof angular with reference to the axis of the hose, this jacket being either woven upon the tube or woven separately and applied thereto; 3, a helical winding, substantially circumferential, of yarn or tape, as desired, exterior to jacket 2, the winding 3 being applied as a single yarn or tape or as several yarns or tapes lying side by side, as desired; 4, a second jacket, similar to jacket 2, but disposed exterior to winding 3; and 5, the exterior jacket, preferably of rubber.

Between jacket 2 and winding 3 and again between winding 3 and jacket 4 there may be applied liquid or sheet rubber to become vulcanized into the complete structure. Circumferential winding 3 gives tangential strength without interfering with flexibility, each joint between contiguous strands of the winding constituting in effect a hinging-point, and at the same time as the strands of the winding separate and approach during the hinging action there is no forcible impingement of them upon the rubber to destroy it, as would be the case were this winding in direct contact with tube 1 or jacket 5, for in the former case tube 1 would be destroyed by the hinging action of the winding, and in the latter case the jacket 5 would be destroyed by that action. In the present construction the circumferential winding is reinforced inwardly and outwardly by diagonal elements of the woven members.

In the construction shown in Fig. 1 the circumferential winding is gotten between inner and outer diagonal elements by disposing it as an independent interposed member in the system. In Fig. 2 I illustrate a jacket fabric

producing the same result, 6 and 7 indicating the diagonal elements of a jacket fabric, while 8 indicates the circumferential or spiral elements, the latter being disposed between the diagonal elements. Such a fabric as is illustrated in Fig. 2 when applied as a jacket results in circumferential strands separated from the inner rubber tube and outer rubber jacket by the diagonal elements of the woven fabric.

I claim as my invention—

1. In hose, the combination, substantially as set forth, of an inner rubber tube, an outer rubber jacket, a substantially-circumferential winding, and diagonal fabric elements interior and exterior to said winding and in contact therewith.

2. In hose, the combination, substantially as set forth, of an inner rubber tube, a diagonally-woven jacket thereon, a substantially-circumferential winding exterior to said jacket and in contact therewith, a diagonally-woven jacket exterior to said winding and in contact therewith, and a rubber jacket exterior to said last-mentioned jacket.

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Witnesses:
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