

F. J. KAUFMANN AND W. N. MARSDEN.

ADHERENTLY UNITING WEBS OF FABRIC.

APPLICATION FILED SEPT. 3, 1919.

Patented Aug. 29, 1922.

6 SHEETS—SHEET 1.

1,427,477.

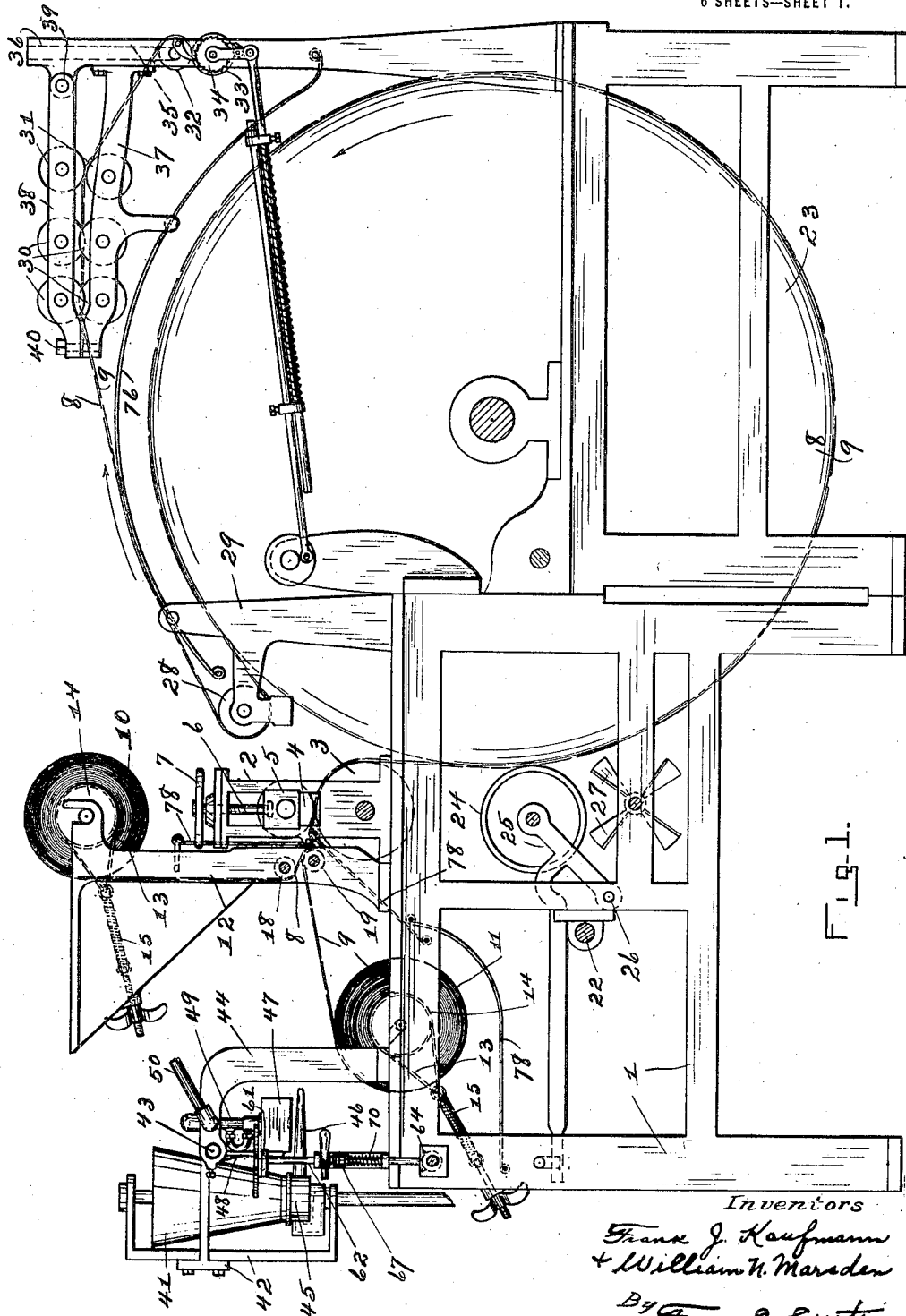


Fig. 1.

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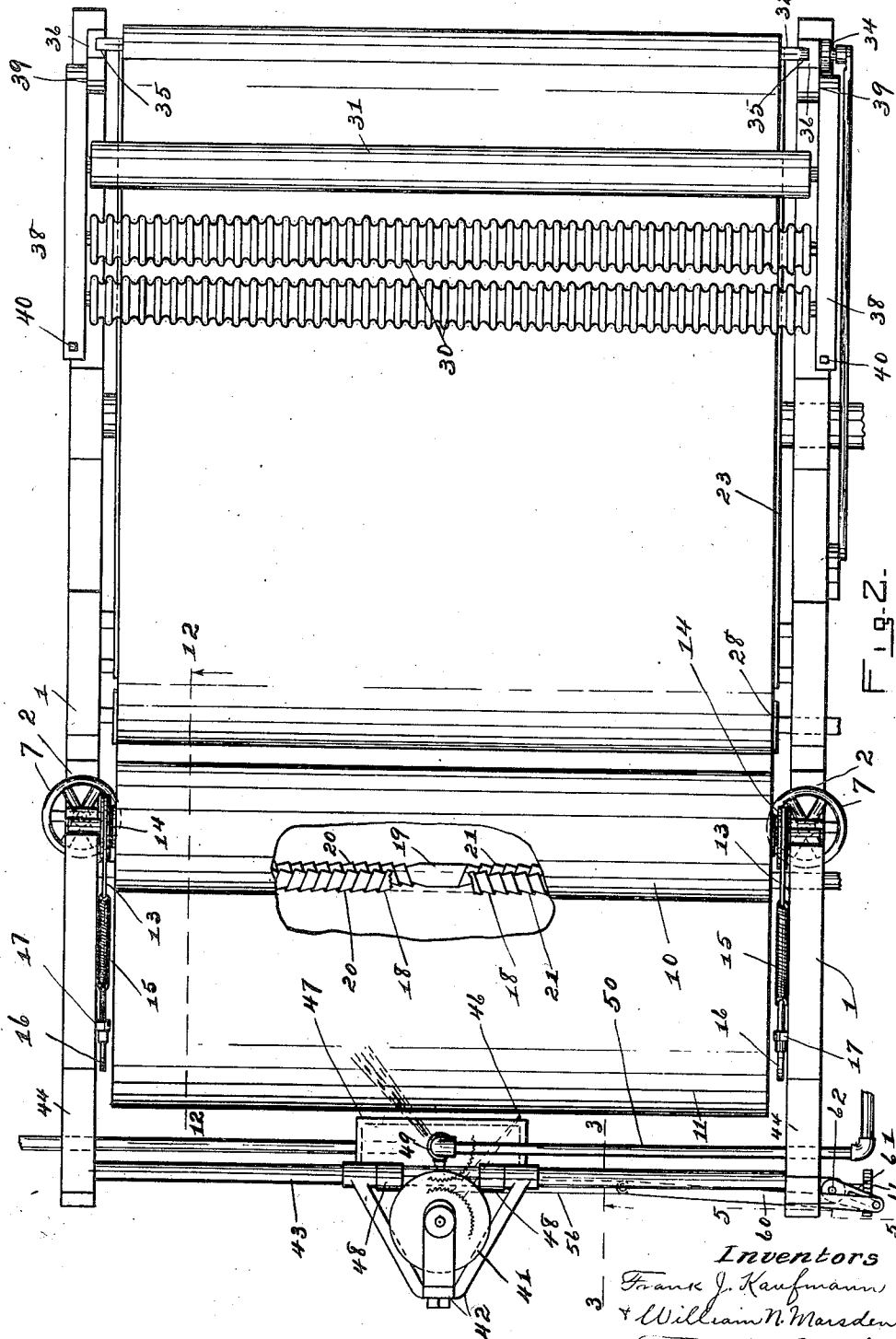


Fig. 2.

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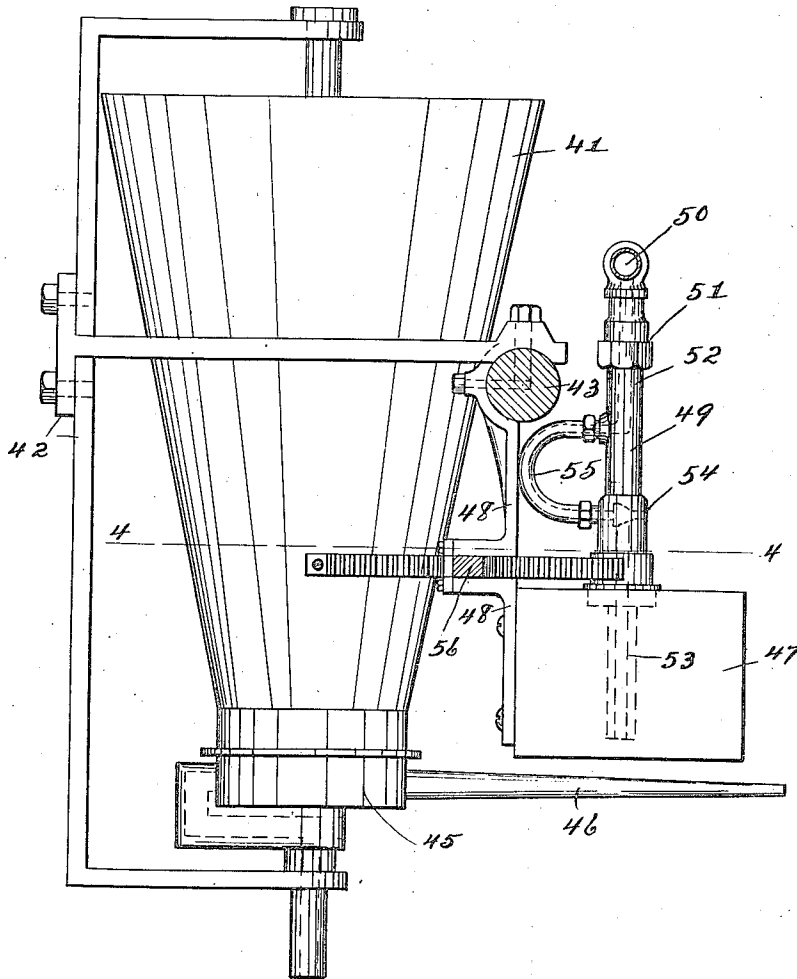
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Fig. 3.



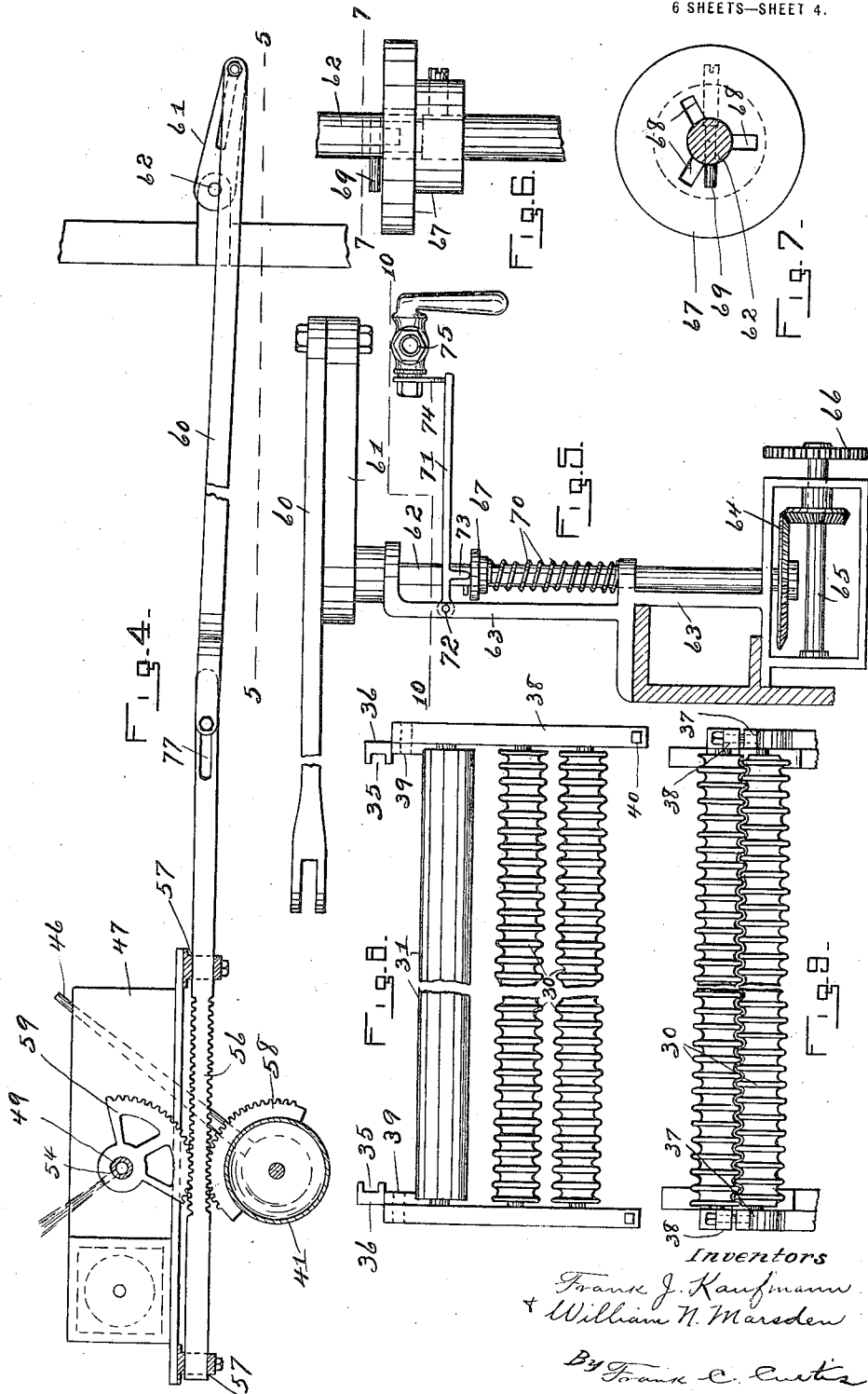
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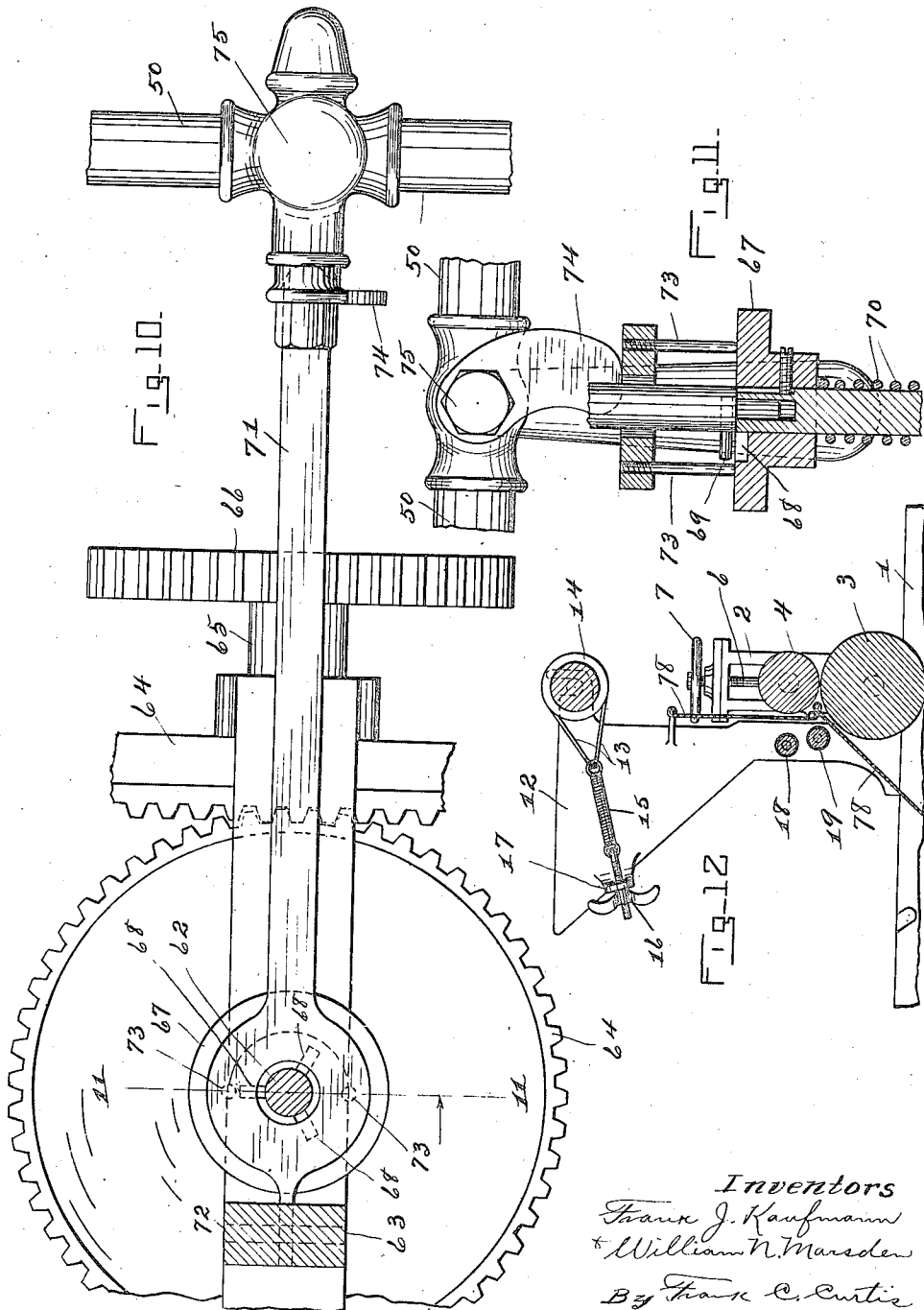
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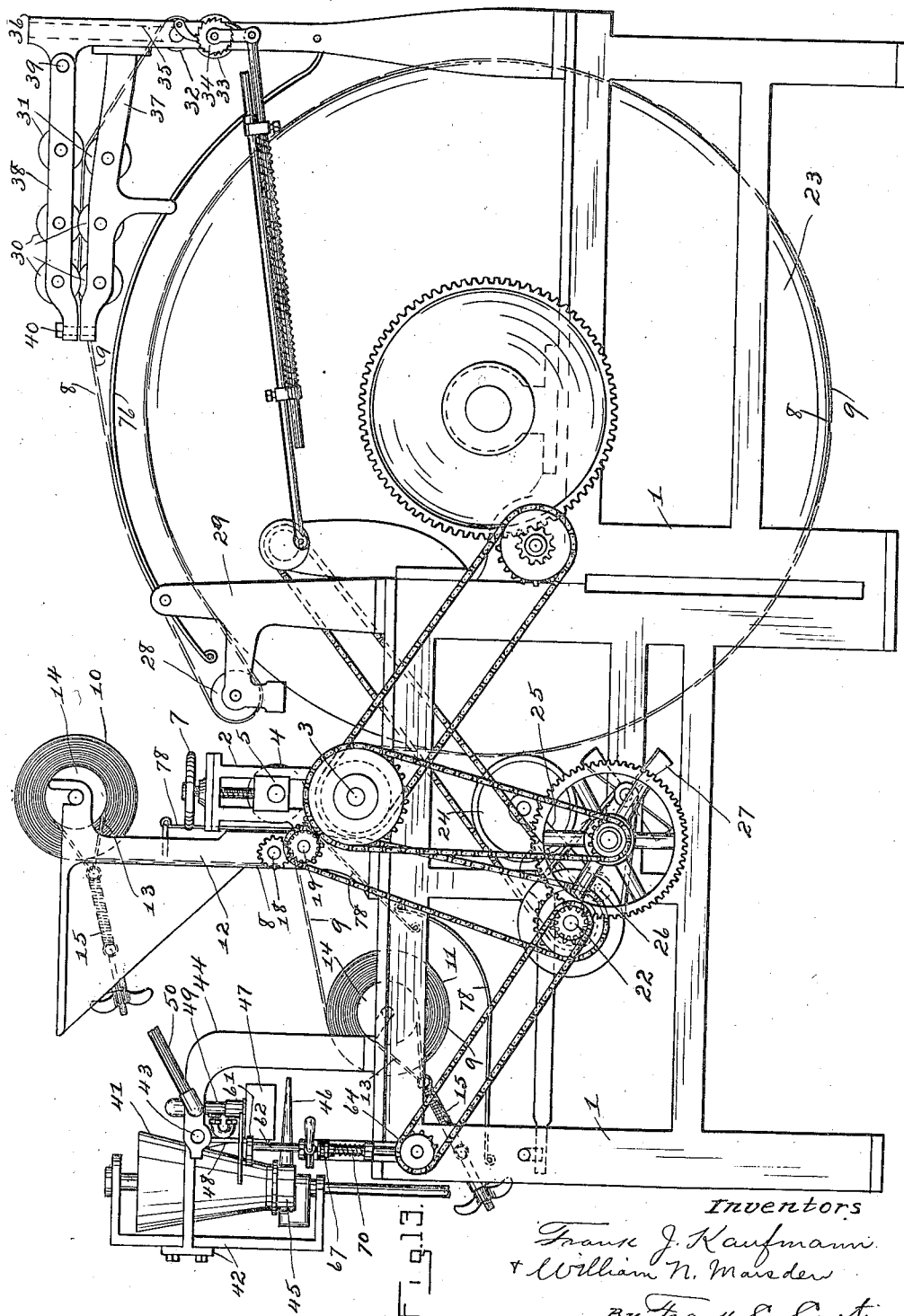


FIG. 13.

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UNITED STATES PATENT OFFICE.

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ADHERENTLY UNITING WEBS OF FABRIC.

1,427,477.

Specification of Letters Patent. Patented Aug. 29, 1922.

Application filed September 3, 1919. Serial No. 321,387.

To all whom it may concern:

Be it known that we, FRANK J. KAUFMANN and WILLIAM N. MARSDEN, citizens of the United States, residing at Amsterdam, in the county of Montgomery and State of New York, have invented new and useful Improvements in Adherently Uniting Webs of Fabric, of which the following is a specification.

Reference may be had to the accompanying drawings, and the reference characters marked thereon, which form a part of this specification. Similar characters refer to similar parts in the several figures therein.

In the manufacture of certain articles from a plurality of thicknesses of fabric it is necessary that the thicknesses or plies of fabric should be adherently united so that during the manufacture of the article the plurality of plies act and are treated in substantially the same manner as a single ply fabric.

Where the fabrics are of a delicate texture, much difficulty is experienced in thus adherently uniting a plurality of webs or plies, due to the tendency of the adhesive to form substantial areas of hardened adhesive at more or less frequent intervals between the plies, and also to the tendency of the adhesive to permeate the fabrics so as to render its presence apparent by discoloration or other injurious effect upon the outer surface of the fabrics.

In the manufacture of silk and cotton gloves it is customary to employ a plurality of adherently united plies, usually two, of silk or cotton fabrics which are quite thin and of fine texture; and it is found difficult in adherently uniting plies of such fabrics to avoid visible evidence of the adhesive on the outer surfaces of the plies, as well as to avoid variations in the flexibility of the resultant compound fabric due to the presence of areas of hardened adhesive at intervals between the plies.

Certain objects of the present invention are to facilitate adherently uniting a plurality of plies or webs of fabric; to obtain

substantially uniform flexibility throughout the adherently united plies; and to prevent visible evidence of the adhesive on the outer surfaces of the plies.

Other objects will appear in connection with the following description.

In carrying out our invention we adherently unite the plies or webs by pressing them together after having interposed between neighboring surfaces thereof an adhesive substance accompanied by moisture in such limited quantities as to cause fibres of one web to adhere directly to substantially opposite fibres of the other web independently of the surrounding fibres in said webs; as a result of which the fabrics are adherently united directly together at a multitude of points each independent of the other points, so that the compound fabric thus formed is substantially as flexible as though no adhesive were present.

Fig. 1 of the drawings is a view in side elevation of a machine for adherently uniting two webs or plies of fabric in accordance with our invention, with the driving connections between the main-power-shaft and the respective driven elements omitted.

Fig. 2 is a top plan view of the same.

Fig. 3 is a longitudinal section taken on the broken line 3—3 in Fig. 2, showing in elevation the mechanism for distributing into the angle between the webs to be adherently united, the adhesive in powdered form and atomized moisture.

Fig. 4 is a horizontal section taken on the broken line 4—4 in Fig. 3, showing a top plan view of a broken-away portion of the machine, with the powder- and moisture-distributing mechanisms and the means whereby their respective nozzles are moved through arcuate paths.

Fig. 5 is a vertical cross section taken on the broken line 5—5 in Figs. 2 and 4, showing in elevation certain parts of the mechanisms whereby the reciprocating movements of the distributing devices for the powder and moisture are accomplished.

Fig. 6 is a view in side elevation on a

larger scale of a broken-away portion of the same, including the clutch-mechanism shown in Fig. 5.

Fig. 7 is a top plan view of the clutch-disk 5 shown in Fig. 6.

Fig. 8 is a top plan view of a set of circumferentially grooved rollers between which the adherently united webs are passed before they are wound up into a roll.

Fig. 9 is a view in elevation of the same.

Fig. 10 is a horizontal cross-section taken on the broken line 10—10 in Fig. 5, viewed from above.

Fig. 11 is a vertical cross-section of the 15 same taken on the broken line 11—11 in Fig. 10.

Fig. 12 is a vertical longitudinal section taken on the broken line 12—12 in Fig. 2.

Fig. 13 is a view similar to Fig. 1, showing 20 the driving-connections between the main power-shaft and the respective driven elements.

Referring to the drawings wherein the invention is shown in preferred form, 1 is the 25 frame of the machine, having upright brackets, 2, containing suitable bearings for rolls, 3 and 4, the bearings, for the roll, 4, being formed in bearing-boxes, 5, vertically movable along open slideways formed in the 30 brackets, 2, whereby said roll, 4, can be adjustably moved toward and from the roll, 3. This adjustment by movement of the roll, 4, is accomplished by means of a screw, 6, actuated by a hand-wheel, 7, in the usual 35 manner.

The rolls, 3 and 4, may be made of any desired material, but we prefer to make the roll, 3, of polished iron and the roll, 4, of rubber. These rolls, 3 and 4, are adapted 40 to press together an upper web, 8, and a lower web, 9, of fabric which webs are to be adherently united.

The web, 8, is fed from a roll, 10, and the web, 9, from a roll, 11, said rolls being 45 rotatively mounted upon bearings on the frame of the machine, the bearings for the roll, 10, being formed in an upright bracket, 12.

A tension device is provided for each of 50 said rolls, the same consisting of a round strap, 13, which passes around a grooved-pulley, 14, in fixed relation to the respective roll, the ends of said strap being connected by a coil-spring, 15, and an adjustable screw 55 take-up, 16, with a lug, 17, in fixed relation to the frame of the machine.

In passing from the rolls, 10 and 11, to the rolls, 3 and 4, the respective webs pass around separate spreading-rolls, 18 and 19, 60 whereby the respective webs are stretched transversely to compensate for the natural contraction of the fabric transversely as the webs leave the supply-rolls, 10 and 11.

Each spreading-roll has upon its surface 65 two ribs, 20 and 21, which wind spirally

around the roll from its respective ends toward its middle, one of said ribs being in the form of a right-hand spiral, and the other of a left-hand spiral.

These ribbed rolls, 18 and 19, are geared 70 together, and positively driven by suitable connections with the main power-shaft, 22, of the machine.

The pitch of the spiral ribs, 20 and 21, is in such a direction that as the web passes 75 around the ribbed roll the spiral ribs exert a worm-like action upon the web from the center toward the side edges of the web, thus tending to spread or stretch the web transversely.

The two webs, 8 and 9, after passing between the rolls, 3 and 4, pass around a drum, 23, rotatively mounted in bearings on the 80 frame of the machine and rotated by suitable driving-connections with the main power-shaft, 22.

This drum, 23, is preferably heated in some suitable manner as by steam; and it preferably has a smooth metal surface.

At substantially the point where the combined webs first make contact with the drum, 23, they are pressed against the drum by means of a padded roll, 24, which may be 90 an idle roll and which is shown mounted in bearings in the oscillatory ends of links, 25, pivoted at 26, upon the frame of the machine; which links extend obliquely upward and rearward whereby said roll, 24, rests by gravity against the drum, 23.

The drum-encircling-webs after leaving 100 the roll, 24, are moved past a fan, 27, rotatively mounted in bearings on the frame of the machine, and driven by suitable connections with the main power-shaft.

The webs pass from the drum, 23, after 105 approximately encircling the drum, over a roll, 28, rotatively mounted in bearings formed in upright brackets, 29, mounted on the frame of the machine from which roll, 28, the webs pass between two successive 110 pairs of loosely interengaging circumferentially grooved rolls, 30, which impart to the webs a sinuous form in cross section corresponding to the form of the space between each pair of said grooved rolls, as shown in 115 Fig. 9.

From the grooved rolls, 30, the webs pass between a pair of padded rolls, 31, whereby the webs are restored to flattened condition. The webs then pass to a take-up roll, 32, 120 adapted to rest upon a driving roller, 33, the roller, 33, being driven by a step-by-step movement by means of pawl-and-ratchet mechanism, 34, the reciprocating member of which is actuated by means of suitable con- 125 nections with the main power-shaft.

The trunnions of the take-up roll, 32, are mounted in vertical slideway grooves, 35, in upright brackets, 36, erected from the frame 130 of the machine,

The lower set of rolls, 30 and 31, have their bearings in brackets, 37, fixed upon and projecting forwardly from the respective brackets, 36, while the upper set of said rolls, 30 and 31, have their bearings in a pair of bearing-plates, 38, pivoted at their rear ends at 39, upon the respective brackets, 36, the front ends of the respective plates, 38, being secured to the respective brackets, 37, by means of screw-bolts, 40.

By removing the screw-bolts, 40, the upper set of said rolls can be swung upwardly away from the lower set of rolls to facilitate the insertion of the webs between the upper and lower rolls.

At the front end of the machine we provide means for interposing between the neighboring surfaces of the webs, 8 and 9, adhesive material such that in the subsequent operation of the machine, the two webs will be adherently united.

For certain purposes of the invention the means for so interposing the adhesive material may be of any known form, and the adhesive material may be applied to the webs in any known manner.

We have shown in the drawings a preferred form of means for thus applying adhesive to the webs whereby a supply of adhesive powder is carried by an air-blast into the angle between the two webs in advance of the rolls, 3 and 4, while at the same time a supply of atomized water is also blown into said angle sufficient to develop the adhesive properties of the adhesive powder.

A supply of adhesive powder is carried by a container, 41, which is rotatively mounted upon a bracket, 42, which is clamped upon a cross-rod, 43, fixedly secured in the upper ends of a pair of upright brackets, 44, erected from the frame of the machine.

Air under pressure is admitted to the base, 45, of the container, 41, whereby the powder is blown from the container in a blast through the nozzle, 46. By oscillating movement of the container, 41, and its nozzle, 46, the nozzle is reciprocated through an arcuate path whereby the adhesive powder is distributed transversely of the webs.

A water-supply tank, 47, is mounted upon the lower end of a bracket, 48, which bracket is clamped upon the cross-rod, 43; and rotatively mounted upon the water-tank, 47, is a post, 49, connected at its upper end with an air-supply pipe, 50, by means of a coupling at 51, which permits oscillating movement of the post, 49.

The upper end of the post is provided with an air-passageway, 52, connecting with the passageway through the pipe, 50.

The lower end of the post is provided with a passageway, 53, leading from the water-tank, 47, with a nozzle-opening, 54,

opening laterally through the side of the post.

An external air-pipe, 55, leads from the lower end of the air-passageway, 52, through the front of the post at a point opposite the nozzle-opening, 54, whereby compressed air supplied from the pipe, 50, is forced through the nozzle-opening, 54, carrying with it in atomized form a supply of water from the water-tank, 47.

By oscillating the post, 49, this supply of atomized water is distributed throughout the width of the webs to develop the adhesive qualities of the powder distributed by the nozzle, 46.

Oscillating movements are imparted to the powder-distributing nozzle, 46, and the water-distributing nozzle, 54, in opposite directions by means of a toothed-rack, 56, which is adapted to reciprocate through slideways, 57, on the bracket, 48, in engagement with a gear-segment, 58, fixed upon the powder-container, 41, and a gear-segment, 59, fixed upon the base of the post, 49.

Reciprocating movements are imparted to the toothed-rack, 56, by means of a pitman-connection, 60, between said rack and a crank, 61, fixed upon the upper end of a vertical shaft, 62, rotatively mounted in bearings on a bracket, 63, fixed upon the frame of the machine.

A slot, 77, in the rack, 96, provides lost-motion in its connection with the pitman, 60, whereby the powder-distributing nozzle and the water-distributing nozzle each remains at rest for a brief interval at the beginning and end of each movement in each direction.

The shaft, 62, is rotated by means of a beveled gear-connection, 64, between said shaft and a shaft, 65, carrying a sprocket-wheel, 66, which is driven by means of suitable connections with the main power-shaft of the machine.

The shaft, 62, is divided, its upper and lower ends being operatively connected together by means of a clutch-member, 67, slidably mounted upon the lower member of the shaft, and provided with slots, 68, severally adapted to receive a pin, 69, on the upper member of the shaft when the clutch-member, 67, is forced upward by means of the coil-spring, 70, which encircles the lower member of said shaft.

The clutch-member is adapted to be disengaged by means of a lever, 71, fulcrumed at 72, upon the bracket, 63, and having lugs, 73, adapted to engage and depress the clutch-member, 67, by a downward movement of the lever, 71.

The end of lever, 71, is in the path of a cam, 74, fixed upon the movable member of a valve or cock, 75, whereby the supply of compressed air to the powder and water-distributing mechanisms is controlled.

The arrangement of the cam, 74, is such that when the supply of compressed air is cut off by the valve, 75, the clutch-member, 67, is disengaged from the pin, 69, and when the valve is open the clutch-member, 67, is in engagement with the pin, 69, causing the powder-distributing nozzle, 46, and the water-distributing nozzle, 54, to be oscillated whenever they are being supplied with compressed air.

A preferred form of powder-distributing apparatus adapted for use in the above described machine is shown and described in an application filed by Frank J. Kaufmann, October 9, 1918, Serial No. 257,498, for powder-distributors.

The operation of the machine is as follows:

As the webs, 8 and 9, pass from their respective rolls to the worm-rolls, 18 and 19, a blast of adhesive powder is blown from the nozzle, 46, into the angle between said webs upon neighboring surfaces of which the powder is deposited. At the same time a supply of atomized water is blown from the nozzle-opening, 54, into said angle, and the atomized moisture thus deposited upon these neighboring surfaces of the webs develops the adhesive qualities of the adhesive powder, causing the resultant adhesive to adherently unite the webs as they pass between the rolls, 3 and 4.

As the united webs pass around the drum, 23, they are further pressed together and against the heated drum by the roll, 24, while subjected to the blast from the fan, 27. As the united webs pass around the heated drum, 23, they become thoroughly dried, and leaving the drum, 23, they pass around the roll, 28, and thence to the grooved-rolls, 30.

A shield, 76, interposed between the stretch of the webs between the rolls, 28, and the grooved-rolls, 30, and the stretch of the webs which is on the upper side of the drum, 23, serves to protect the upper stretch of the webs from any steam or moisture which might emanate from the webs in their passage around the heated drum.

In passing between the grooved-rolls, 30, the united webs are flexed and bent in different directions whereby should there be any substantial area of hardened adhesive between the webs it will be broken up to render the webs thoroughly flexible.

The webs pass from the grooved-rolls, 30, between the padded rolls, 31, whereby they are restored to flat condition preparatory to being wound around the take-up roll, 32.

By properly regulating the supply of powder and the supply of moisture, we are able to supply the proper amount of adhesive powder accompanied by moisture in such limited quantities as to cause fibres of one web to directly adhere to substantially opposite fibres of the other web independ-

ently of the surrounding fibres in said webs; and also to adherently unite the webs without penetration of the adhesive to the outer surface fibres of either web, so that with most fabrics the grooved-rolls, 30, will be found unnecessary as there will be no substantial areas of hardened adhesive between the webs to be broken up by said grooved-rolls.

For certain purposes of the invention therefore, said grooved-rolls are immaterial.

In carrying out our above described process or method of adherently uniting a plurality of webs of fabric, we do not wish to be limited to the use of the particular form of apparatus shown in the drawings, nor to any particular form of apparatus in carrying out said method, as an active adhesive substance, or a dry adhesive substance and a separate supply of moisture, can be applied in any known manner and by the use of any known apparatus, such that a proper quantity of adhesive material is applied to the surface of the web or webs accompanied by moisture in such limited quantities as to cause fibres of one web to adhere directly to substantially opposite fibres of the other web independently of the surrounding fibres in said webs and without penetration of the adhesive to the outer surface-fibres of the webs.

The rolls, 3 and 4, are shielded by aprons or guards, 78, placed in front of the rolls to intercept any of the adhesive powder or moisture which might escape past the webs. In Fig. 1 the webs in their passage through the machine are indicated by broken lines.

In applying the adhesive substance accompanied by moisture to the webs by means of an air-blast in the preferred manner above particularly described, the adhesive substance and the moisture are applied to the webs solely by their own momentum, thus making it possible to regulate with great nicety the limited quantities applied to the web-surfaces.

What we claim as new and desire to secure by Letters Patent is—

1. That improvement in the art of adherently uniting a plurality of webs of fabric which consists in pressing said webs together after having interposed between neighboring surfaces thereof a dry adhesive powder, simultaneously with, atomized moisture in such limited quantities as to cause inner surface-fibres of one web, without penetration of the mixture to its outer surface fibres, to adhere to the other web.

2. That improvement in the art of adherently uniting a plurality of webs of fabric which consists in pressing together said webs, and immediately in advance of the pressing operation introducing between neighboring surfaces of said webs a blast

of adhesive powder, and atomized moisture sufficient to render said powder adhesive.

3. In a machine for adherently uniting a plurality of webs of fabric and in combination, a pair of pressure-rolls; means for feeding the webs to said rolls; an adhesive-powder distributor in advance of said rolls arranged to distribute adhesive powder between neighboring surfaces of said webs; and atomizing means in advance of said rolls for combining moisture with said adhesive powder.

4. In a machine for adherently uniting a plurality of webs of fabric and in combination, a pair of pressure-rolls; means for feeding the webs to rolls; an atomizing nozzle in advance of said rolls; means for oscillating said atomizing nozzle through an arcuate path opposite the angle between said webs; means for supplying air and moisture to said atomizing nozzle; and means for depositing adhesive powder between neighboring surfaces of said webs in advance of said rolls.

5. In a machine for adherently uniting a plurality of webs of fabric and in combination, a pair of pressure-rolls; means for feeding the webs to the rolls; an atomizing nozzle in advance of said rolls; means for oscillating said atomizing nozzle through an arcuate path opposite the angle between said webs; means for supplying air and moisture to said atomizing nozzle; a powder-distributing nozzle in advance of said rolls; means for oscillating said powder-distributing nozzle through an arcuate path opposite the an-

gle between said webs; and means for supplying powder to said nozzle and projecting the same therefrom.

6. In a machine for adherently uniting a plurality of webs of fabric and in combination, a pair of pressure-rolls; means for feeding the webs to the rolls; a powder-distributing nozzle in advance of said rolls; means for oscillating said nozzle through an arcuate path opposite the angle between said webs; means for supplying powder to said nozzle and projecting the same therefrom; and means for supplying moisture to the distributed powder in the angle between said webs.

7. In a machine for adherently uniting a plurality of webs of fabric and in combination, a pair of pressure-rolls; means for feeding the webs to the rolls; an atomizing nozzle and a powder-distributing nozzle both mounted to oscillate opposite the angle between the webs; gear-mechanism connected with the respective nozzles whereby they can be oscillated; a toothed-rack engaging said gear-mechanisms; a cam for reciprocating said toothed-rack; means for supplying moisture and air under pressure to said atomizing nozzle; and means for supplying adhesive powder and air under pressure to said powder-distributing nozzle.

In testimony whereof, we have hereunto set our hands this 15th day of August, 1919.

FRANK J. KAUFMANN.
WILLIAM N. MARSDEN.