

June 8, 1948.

J. H. SHAY

2,442,906

HOOKEK RUG MACHINE

Filed June 11, 1946

2 Sheets-Sheet 1

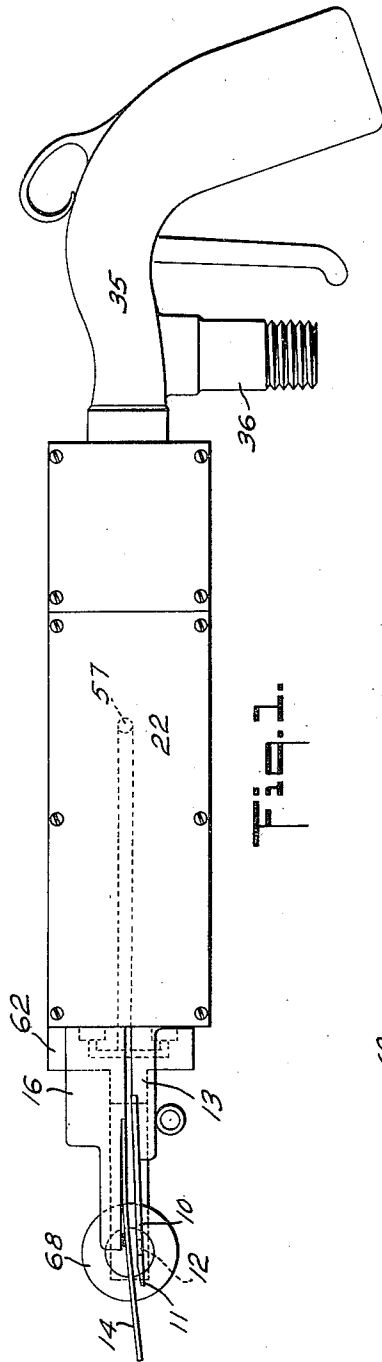


Fig. 1.

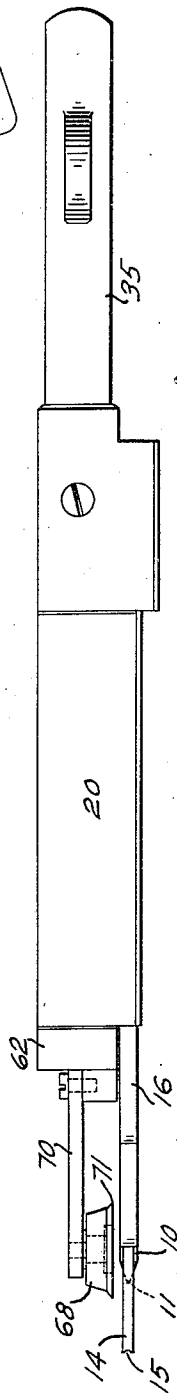


Fig. 2.

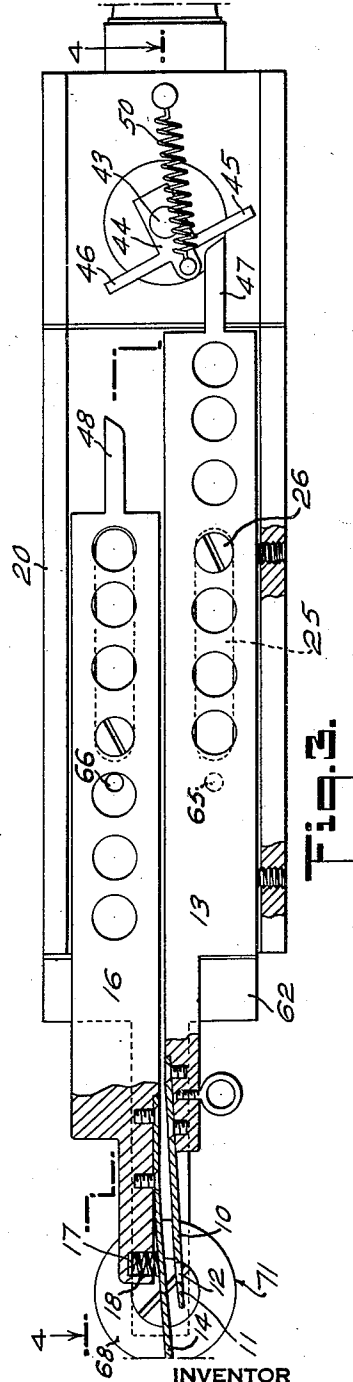


Fig. 3.

INVENTOR
JAMES H. SHAY
BY
Barr, Borden & Fox
ATTORNEYS

June 8, 1948.

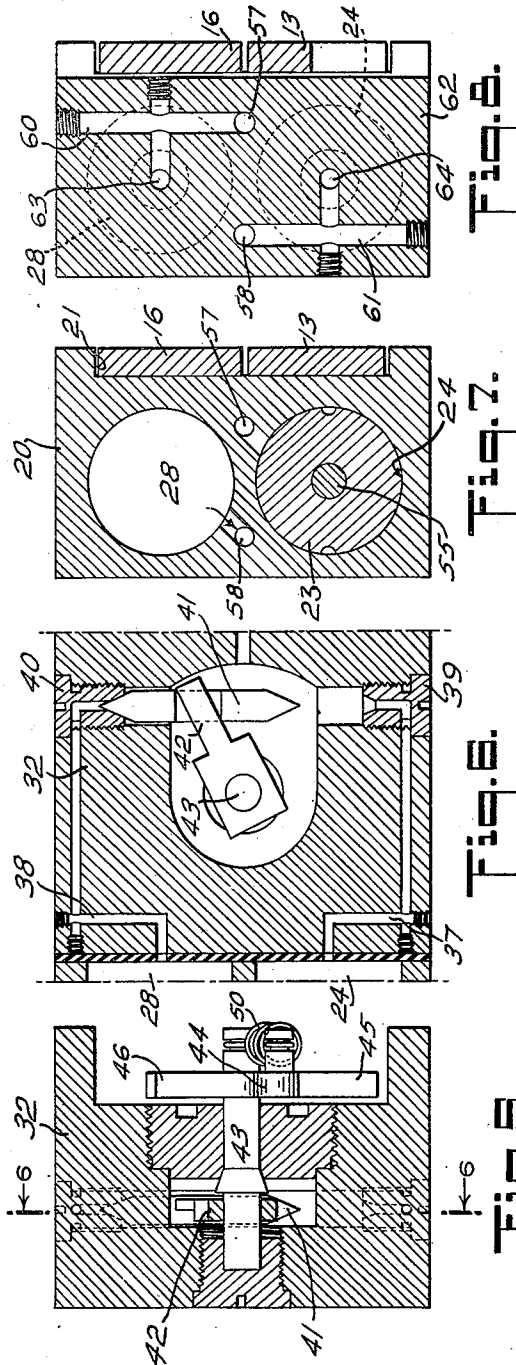
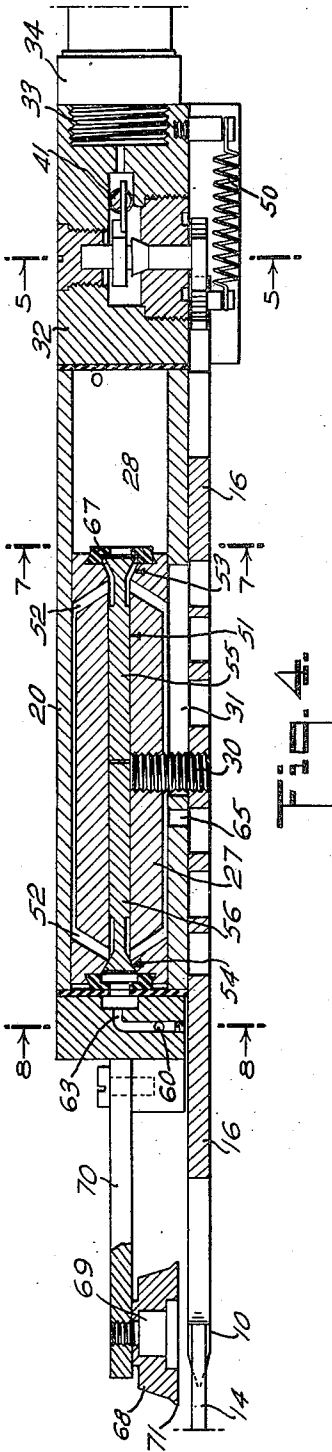
J. H. SHAY

2,442,906

HOOKE RUG MACHINE

Filed June 11, 1946

2 Sheets-Sheet 2



INVENTOR
JAMES H. SHAY
BY
Bar, Borden & Fox
ATTORNEYS

UNITED STATES PATENT OFFICE

2,442,906

HOOKED RUG MACHINE

James H. Shay, Newtown Square, Pa., assignor
to Shaycraft, Inc., Newtown Square, Pa., a cor-
poration of Pennsylvania

Application June 11, 1946, Serial No. 676,037

5 Claims. (Cl. 112—80)

1

The present invention relates to the making of pile fabrics and more particularly to a power operated machine for making hooked rugs or other fabrics wherein wool yarn, strips of cloth or other pliable material is looped through a backing, such as burlap, in accordance with a predetermined design.

In the making of hooked fabrics, it has heretofore been proposed to employ manually operated devices wherein a needle and looper are employed for piercing the backing and forming bights on the face of the backing. Such devices are slow to manipulate, require great skill to follow the pattern and are generally far from uniform in the completed rug or fabric. Also, it has been proposed to employ power driven needles in an endeavor to speed up production, but in so doing, by the complicated power means used, the cumbersome equipment has been found hard to handle, irregularities between bights are of frequent occurrence, and there is a complete absence of control to ensure one row of bights correctly paralleling the next adjacent row.

Some of the objects of the present invention are: to provide an improved machine for piercing a backing and forming loops or bights according to a predetermined pattern or design; to provide a portable, hand operated power driven machine for making hooked rugs or other fabrics; to provide a light weight, simple machine for making hooked rugs; to provide a hooked rug machine wherein it is possible to follow a design with maximum exactness and produce patterns precisely uniform in appearance; to provide a hooked rug machine wherein adjustment can be made for varying size of yarns and the like; to provide a power driven hooked rug machine where the needle is positively guided from one row to the next; and to provide other improvements as will hereinafter appear.

In the accompanying drawings, Fig. 1 represents a side elevation of a machine for making hooked rugs embodying one form of the present invention; Fig. 2 represents a plan of the same; Fig. 3 represents a side elevation of the machine with the cover plates removed and partly broken away for more detailed showing; Fig. 4 represents a section on line 4—4 of Fig. 3; Fig. 5 represents a section on line 5—5 of Fig. 4; Fig. 6 represents a section on line 6—6 of Fig. 5; Fig. 7 represents a section on line 7—7 of Fig. 4; and Fig. 8 represents a section on line 8—8 of Fig. 4.

Referring to the drawings, one form of the present invention comprises a needle 10 formed of a relatively thin, flat, metal strip terminating in a bevelled V-shaped piercing point 11, adjacent to which is an eye 12 through which the yarn passes. The opposite end portion of the needle 10 is suitably enched in a recess formed in the end of a slide bar 13 arranged to be mounted and

2

reciprocated, as will be later explained. It should be noted that the support for the needle is machined on an angle of about two degrees with respect to its slide bar 13 for proper relation to a looper 14. The function of the needle 10 is to pierce the provided backing and deliver a predetermined length of yarn through the backing to the face thereof.

For forming the loop or bight in the yarn which has been pushed through the backing by the needle 10, the looper 14 is provided to lie along and in close proximity to the yarn outlet side of the needle 10, this looper 14 comprising a relatively thin, metal strip terminating at its outer end in an arcuate recess 15 to receive the yarn and hold it while the needle 10 is withdrawn, and in this way form the required loop on the face of the backing. The opposite end of the looper 14 is made fast to a reciprocable slide bar 16 in which a recess is provided to receive and fasten the looper end portion. The side of the slide bar 16 is provided with a bore 17 for seating a compression spring 18 which bears at its protruding end against the looper 14 to hold it flexed toward the needle 10 to insure proper yarn pick-up.

In order to mount the two slide bars 13 and 16 for straight line reciprocation, a cylinder block 20 is provided having a recess 21 extending lengthwise thereof and of a width to receive the two slide bars 13 and 16 in edge to edge relation and of a depth substantially equal to the thickness of the said bars. A plate 22 serves as a cover over the recess 21 and prevents displacement of the bars. Each bar 13 and 16 is of a length to project endwise from the block 20 the proper distance for actuation of the needle and looper and for unobstructed observation thereof.

For the purpose of reciprocating the slide bar 13, a piston 23 is provided to ride in a cylinder bore 24 formed in the block 20 in alined relation with the slide bar 13, that is the axis of the bore 24 lies in the plane of the median line of the bar 13. Also, the block 20 is provided with a slot 25 to serve as a guide for a piston pin 26, which is threaded into the piston 23 and projects from the slot 25 to seat in a hole in the bottom of the slide bar 13. Thus, as the pin 26 is reciprocated by the movement of the piston 23, a like motion is transmitted to the slide bar 13. Likewise, a piston 27 is located in a second cylinder bore 28 formed in the block 20, beside the first bore 24 but alined with the slide bar 16. The axis of the bore 28 lies in the plane of the median line of the slide bar 16 in order to transmit motion from the piston 27 to the slide bar 16 by way of a projecting pin 30. The pin 30 rides in a slot 31 formed in the block 20 between the slide bar and the piston 27, as will be understood.

As a means for supplying motive fluid, such as compressed air, to the pistons 23 and 27, the end of the block 20, opposite to the end from which the needle and looper bar project, is closed by an air chest 32 having an air inlet in the form of a projecting threaded nipple 33 and coupling bushing 34 by which a handle 35 is attached to deliver compressed air from a hose connection 36. The air chest 32 is provided with two ports 37 and 38 leading respectively to the piston bores 24 and 28 from two valve housings 39 and 40, each of which opens into the air chest and has a valve seat for control purposes. In the present instance, the housings 39 and 40 are arranged in aligned relation, for alternate communication with the air chest 32, and are controlled by a common double ended needle or valve control member 41.

For moving the needle 41 to open one housing and close the other, it is mounted on a rock lever 42 fixed to a rock post 43, journaled in the block 20, and carrying a rock arm 44 having two oppositely disposed projecting trip lugs 45 and 46. The location of the post 43 and the length of the lugs 45 and 46 is such that the lug 45 is in the path of a trip pin 47 projecting from the slide bar 13, and the lug 46 is in the path of a trip pin 48 projecting from the slide bar 16. Thus, when one slide bar pin contacts a lug, the post 43 is rocked to close one air control valve and to open the other. This valve control is given a snap action by means of a tension spring 50 stretched between a part of the rock arm 44 and the housing, and the arrangement is such that the trip action of trip pin 47 swings the rock arm 44 across the axis of the spring with the resulting snap operation. Thus, when a slide approaches the end of its non-working stroke, it trips the valve control to admit air pressure to the same piston to start the slide back on its working stroke.

In order to reciprocate the two slide bars 13 and 16 in timed relation to the cycle of operations, each of the pistons 23 and 27 is provided with an axially disposed through bore 51 and lateral exhaust vents 52, and the respective ends of the bore 51 terminate in valve seats 53 and 54. An elongated valve member 55 is slidably arranged in the bore 51 for engagement with the seat 53, and a like valve member 56 is slidably arranged at the other portion of the bore 51 for engagement with the seat 54. The length of the two aligned valve members 55 and 56 is such that when one is closed by the air pressure, it will contact the other and move it to open position to allow that end of the cylinder to exhaust.

As a means for transferring air pressure from one end of each cylinder to the other end of the other cylinder so that the slide bars are alternately returned, the block 20 is provided with two by-pass conduits 57 and 58, one above the other, in a plane between the two cylinder bores 24 and 28, the conduit 57 having communication with the bore 24 at a point near the end of the working stroke of the piston 23, and the conduit 58 having communication with the bore 28 at a point near the end of the working stroke of the piston 27. The two conduits 57 and 58 terminate respectively in register with two ports 60 and 61 formed in the cylinder head 62 of the cylinder block 20. The port 60 communicates with an inlet port 63 coaxially disposed for communication with the end of the cylinder bore 28, and the port 61 communicates with an inlet port 64 coaxially disposed for communication with the end of the

cylinder bore 24. Thus, as one piston is completing its working stroke, the by-pass to the other piston cylinder is opened and the opposite piston returns its slide bar, which in turn snaps the needle valve to admit pressure for the working stroke of that slide bar.

To ensure the required rapid reciprocation of the needle 10 and the looper 14, and to quickly exhaust the end of the cylinder to prevent back pressure from retarding the working strokes of the respective pistons 23 and 27, two ports 65 and 66 are provided in the cylinder block 20 for respectively communicating with the cylinders when each piston reaches substantially the end of its non-working stroke. When this latter occurs, the proper port, either 65 or 66, is uncovered so that the cylinder end exhausts promptly and the return of that piston on its working stroke meets with no back pressure to delay the motion of the respective slide bars 13 and 16.

It should be noted that each piston 23 and 27 carries a soft rubber bumper 67 in its ends to absorb any jar or vibration at the end of the piston stroke, and which also act as covers over the piston exhaust valve openings. Each bumper 67 has a center hole to allow exhaust air to escape into and around the exhaust valves, and the incoming air under pressure also enters these holes to close the exhaust valves at the beginning of the piston travel. This operation occurs at either end of the piston, according to the direction it is to move.

For the purpose of guiding the needle 10 along the backing and aid in following the design, a roller 68 is journaled on a stub shaft 69 carried laterally by a support arm extension 70 projecting forwardly from the block 20. This mounting is such that the one face of the roller 65 rides in close proximity to both the needle 10 and the looper 14. This face is formed by providing a circumferential flange 71 which is bevelled toward the face to form a relatively thin rim which serves as a means to ensure uniform laying of one row of loops with respect to another, since it has a dual function of guide and spacer for the material being run. Thus, the narrow rim uses the previously run row of loops as a guide or track. The space desired between the loop rows is governed in width by the distance this rim is from the edge of the needle 10. Furthermore, by varying the length of the extension 70 the pile or loops can be made to various lengths because the position of the roller is directly related to the effective portion of the piston stroke.

With the yarn threaded through the guides 72 and eye 12 of the needle 10, the machine is ready for use, so the roller 68 is placed against the backing and the supply valve on the handle part 35 can be opened. Assuming that the needle valve 41 is in position to open the port 36 to admit pressure to the needle cylinder, then the slide bar 13 makes its working stroke to project the needle 10 through the backing to form the loop. At the end of this working stroke the conduit 57 bypasses the air to the looper cylinder to shift the looper on its non-working stroke and at the end of which its trip pin 48 moves the rock lever 42 to open the port 38 and admits air pressure to the looper cylinder for its working stroke. At the end of this working stroke the looper engages and holds the loop formed by the needle and at the same time transfers the air pressure by way of the conduit 58 to the needle cylinder to start the needle back on its non-working stroke. When

the slide bar 13 brings its trip pin 47 against the rock lever 42, the needle valve is shifted to admit pressure air into the needle cylinder for the working stroke of the needle. At the time this pressure is admitted to the cylinder, the opposite end of that piston has exhausted through the vent port 65, and therefore the piston is shot forward without encountering any back pressure. This ensures the high speed work of both the needle and the looper with consequent fast looping. Thus, during one reciprocation of each slide bar, the other remains stationary, that is, the needle stops while the looper makes a complete stroke, and the looper stops while the needle makes a complete stroke. In the latter instance the looper thus holds the loop ready for the needle to advance to pierce the backing for the next loop. So the cycle continues, the needle and looper both operating at high speed in timed relation and allowing the machine to be moved rapidly over the pattern. Furthermore, by reason of the bushing attachment for the handle 25, it is possible to rotate the working unit around the handle by three hundred and sixty degrees.

It will now be apparent that a complete unitary hook rug machine has been devised which is small, light in weight, easily maneuverable, and adapted for any type of straight or design work. The speed of operation is under control of the operator at all times by means of the associated air supply handle.

Having thus described my invention, I claim:

1. A machine for making hooked rugs and the like, comprising a cylinder block having two bores therein in side to side relation, pistons in the respective bores, two actuating bars slidably mounted in said block, means connecting each bar with its piston, a needle carried by one slide bar, a looper carried by the other slide bar beside said needle, valve means for controlling a pressure medium to operate said pistons, means actuated by said slide bars for operating said controlling means to admit pressure alternately to said bores for reciprocating said pistons, whereby said needle and looper are reciprocated in timed relation, and means for transferring the pressure air during a working stroke of one piston to the other piston for a non-working stroke of the latter piston.

2. A machine for making hooked rugs and the like, comprising a cylinder block having two bores therein in side to side relation, pistons in the respective bores, two actuating bars slidably mounted in said block, means connecting each bar with its piston, an air chest for connection to a source of air pressure, means forming two valve seats for respectively controlling air pressure to said bores, a valve common to said valve seats, a rocker arm for shifting said valve from one seat to the other, means actuated by the respective slide bar for operating said rocker arm to alternately admit compressed air from said chest to said bores, means for transferring the pressure air during a working stroke of one piston to the other piston for a non-working stroke of the latter piston, a needle carried by one slide bar, and a looper carried by the other slide bar.

3. A machine for making hooked rugs and the like, comprising a cylinder block having two bores therein in side to side relation, pistons in the respective bores, two actuating bars slidably

mounted in said block, means connecting each bar with its piston, an air chest for connection to a source of air pressure, means forming two valve seats for respectively controlling air pressure to said bores, a valve common to said valve seats, a rocker arm for shifting said valve from one seat to the other, means actuated by the respective slide bar for operating said rocker arm to alternately admit compressed air from said chest to said bores, means for transferring the pressure air during a working stroke of one piston to the other piston for a non-working stroke of the latter piston, a needle carried by one slide bar, a looper carried by the other slide bar, and a roller carried by said block to engage a backing in advance of said needle to predetermine the length of the loops.

4. A machine for making hooked rugs and the like, comprising a cylinder block having two bores therein in side to side relation, pistons in the respective bores, two actuating bars slidably mounted in said block, means connecting each bar with its piston, a needle carried by one slide bar, a looper carried by the other slide bar beside said needle, valve means for controlling a pressure medium to operate said pistons, means actuated by said slide bars for operating said controlling means to admit air under pressure alternately to said bores for reciprocating said pistons, whereby said needle and looper are reciprocated in timed relation, means for transferring the pressure air during a working stroke of one piston to the other piston for a non-working stroke of the latter piston, and means to exhaust pressure from each piston cylinder before admitting pressure to the working end of said piston cylinder.

5. A machine for making hooked rugs and the like, comprising a cylinder block having two bores therein in side to side relation and exhaust ports communicating respectively with said bores, pistons in the respective bores, valve means in said pistons for alternately connecting opposite ends of each bore with said exhaust ports, said valve means being opened by impact of its piston with the respective ends of the piston bore, two actuating bars slidably mounted in said block, means connecting each bar with its piston, a needle carried by one slide bar, a looper carried by the other slide bar beside said needle, valve means for controlling a pressure medium to reciprocate the respective pistons, means actuated by said slide bars for operating said controlling means to admit air under pressure alternately to said bores for reciprocating said pistons whereby said needle and looper are reciprocated in timed relation, and means for transferring the pressure air during a working stroke of one piston to the other piston for a non-working stroke of the latter piston.

JAMES H. SHAY.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
340,189	Bailey et al. -----	Apr. 20, 1886
463,548	Ross -----	Nov. 17, 1891
1,450,031	Gallagher et al. -----	Mar. 27, 1923
2,226,632	Miller et al. -----	Dec. 31, 1940