United States Patent [19]

King et al.

[11] **3,874,648**

[45] **Apr. 1, 1975**

[54] **SHEET SHINGLING MACHINE**

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[52] **U.S. Cl.** **270/53**, 270/58

[51] **Int. Cl.** **B42b 1/02**

[58] **Field of Search** 270/12, 15, 17, 51, 45–46, 270/52, 54, 58–59; 271/11–13

[56] **References Cited**

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2,790,637	4/1957	Waller	270/58
2,816,755	12/1957	Dusenbury et al.	270/58
2,816,756	12/1957	Dusenbury et al.	270/58

Primary Examiner—Robert W. Michell
Assistant Examiner—A. Heinz
Attorney, Agent, or Firm—Wells, St. John & Roberts

[57] **ABSTRACT**

A machine for shingling a multiplicity of strips of sheet material so that a narrow portion of each strip below the top one extends beyond the overlying sheets and all the strips are secured together. A frame carries a horizontally extending suction head having slots in the top and having air suction means leading to the slots. Individual plates are moved over the suction head being guided by guides on the frame to move lengthwise of the slots. The plates have rows of apertures extending parallel to the slots. The apertures in each row are spaced apart the distance the strips are to be overlapped. A support for a stack of strips is reciprocated on the frame alongside the suction head but above the plane in which the plates move. A suction device, mounted on the frame moves between a position over the support to pick up a strip from the stack upwardly and to lower it downwardly over the suction head to deliver a sheet on to the plate. A glue depositing device movable with the suction device applies glue spots to each moved strip. Stop means locate the plate for each shingled unit.

11 Claims, 17 Drawing Figures

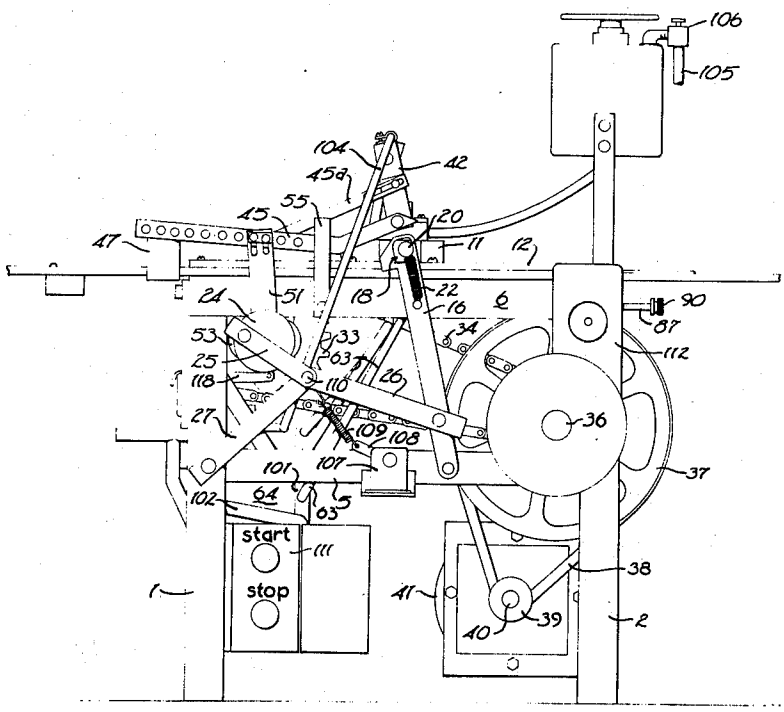


FIG 1

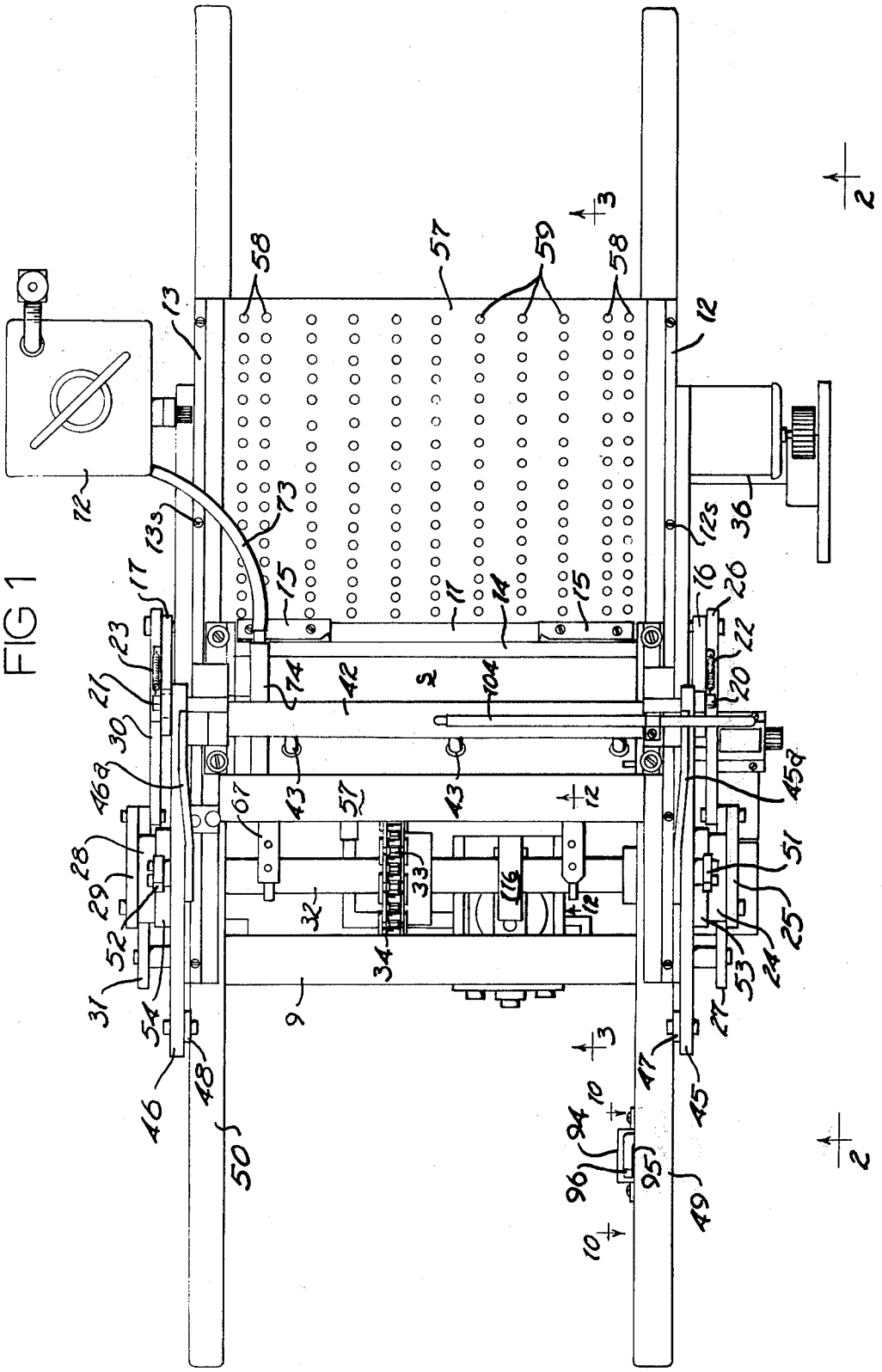

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FIG 2

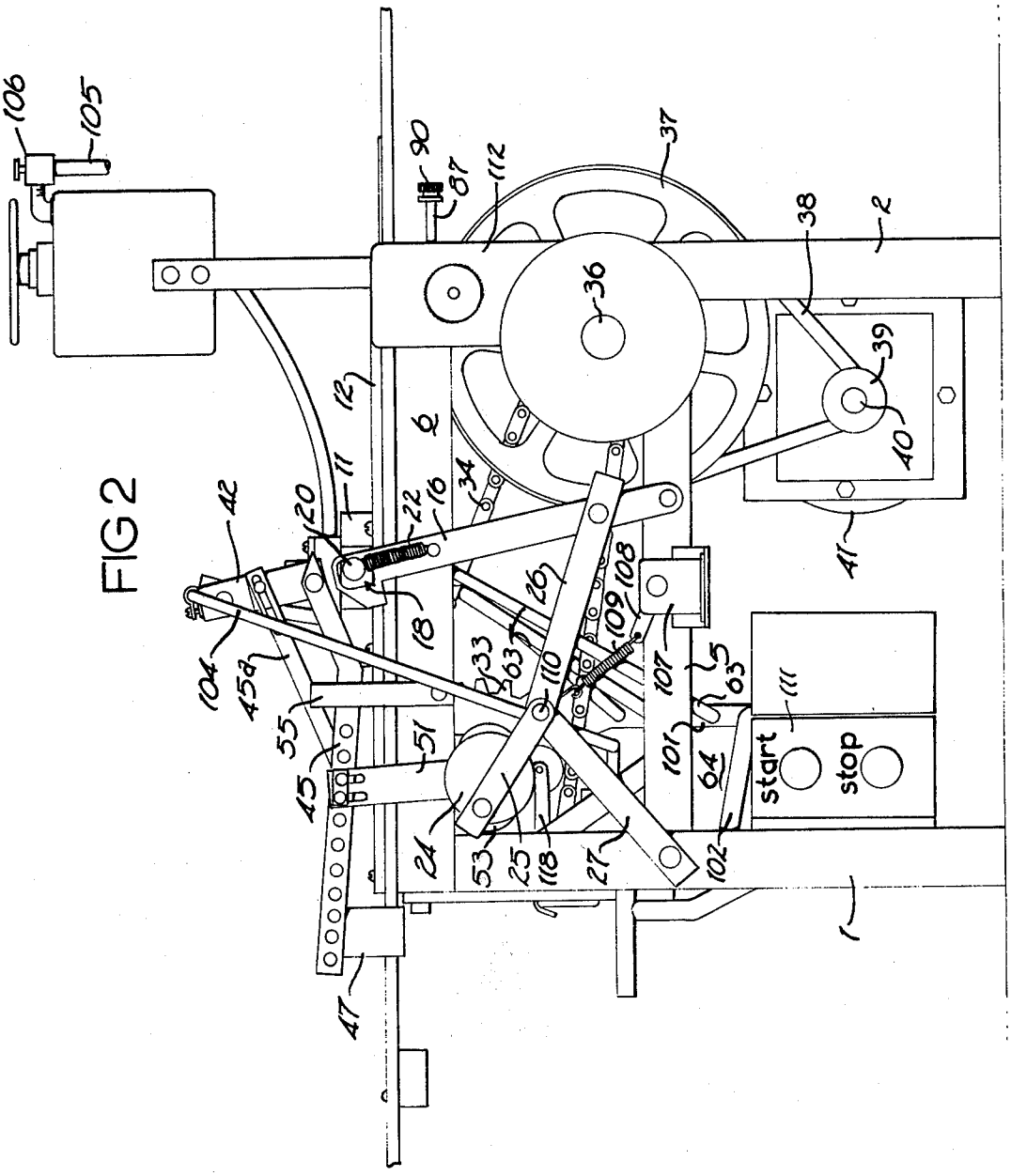

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104
45a
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102
1
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FIG 3

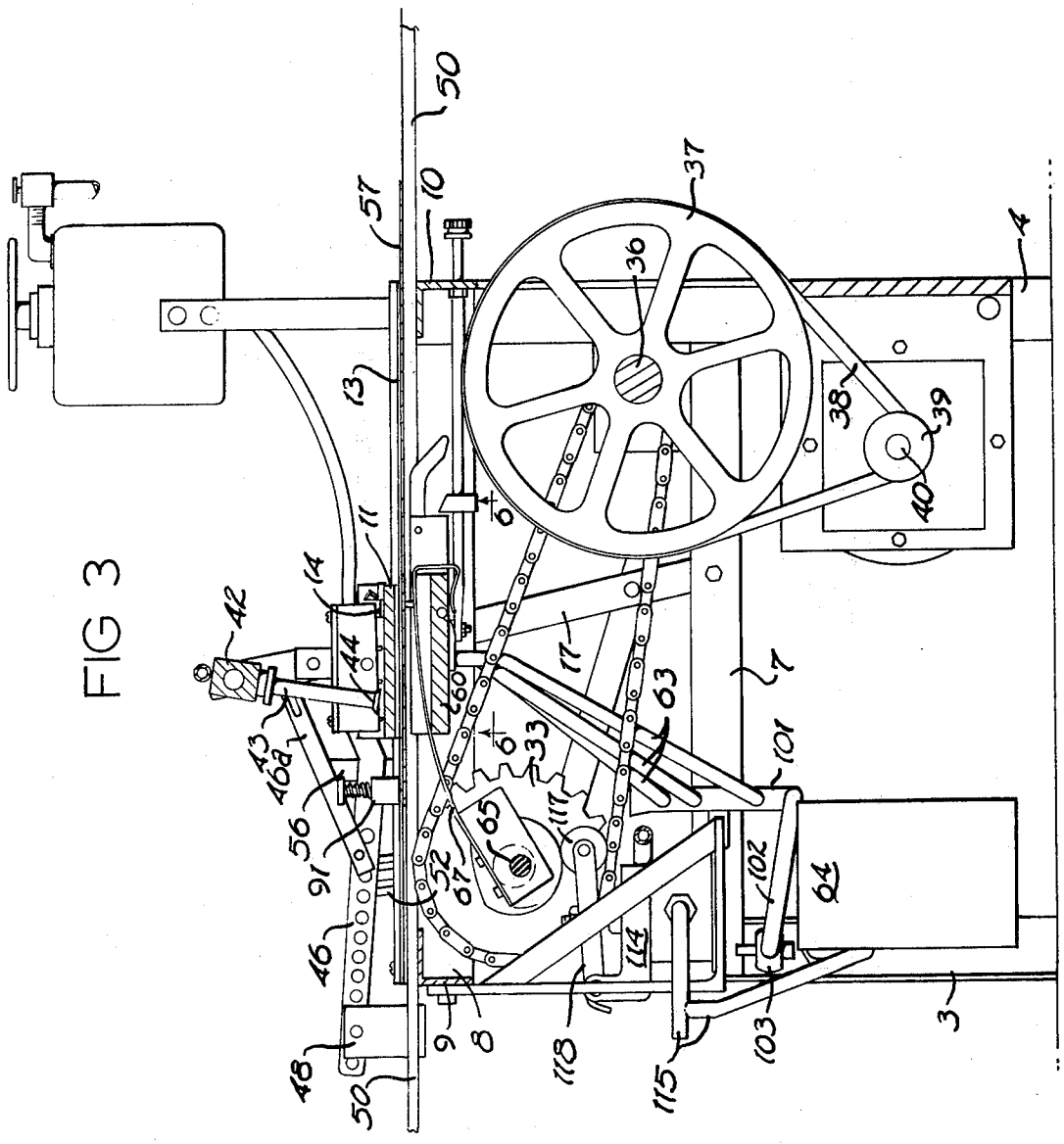
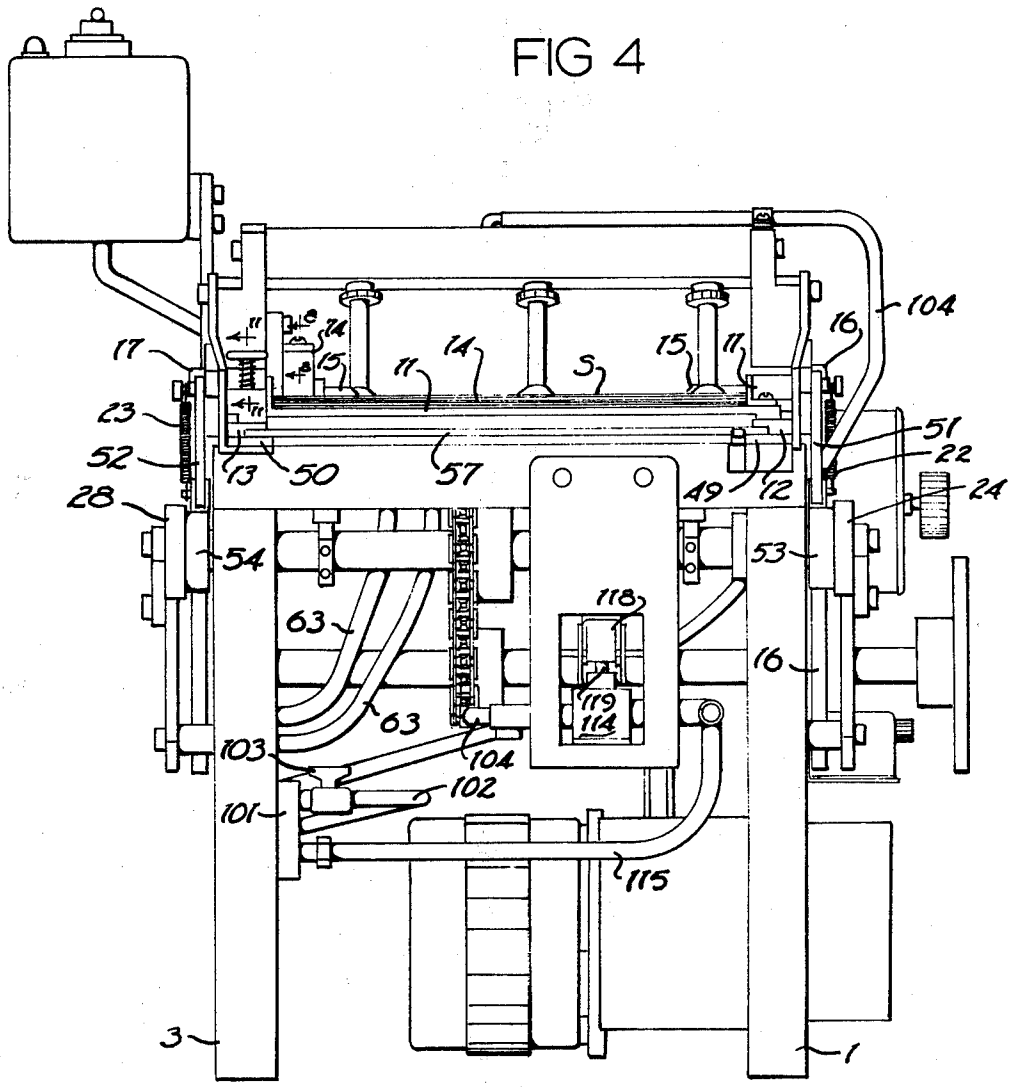

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43
46a
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FIG 4


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22
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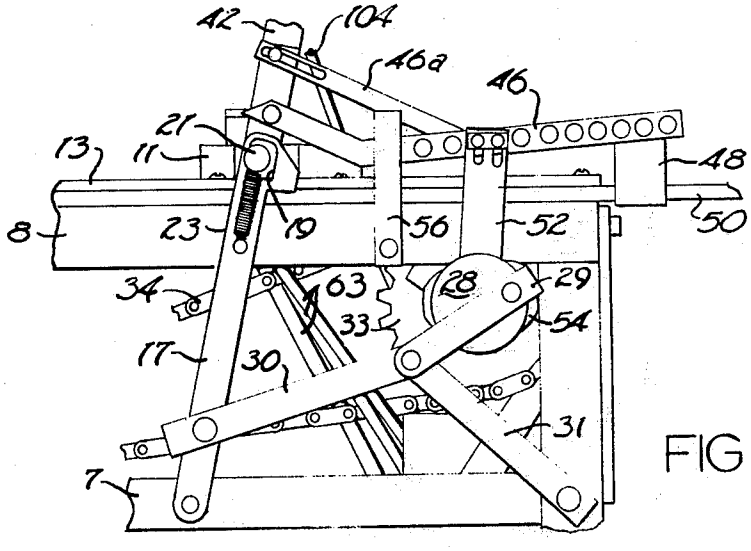

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FIG 17

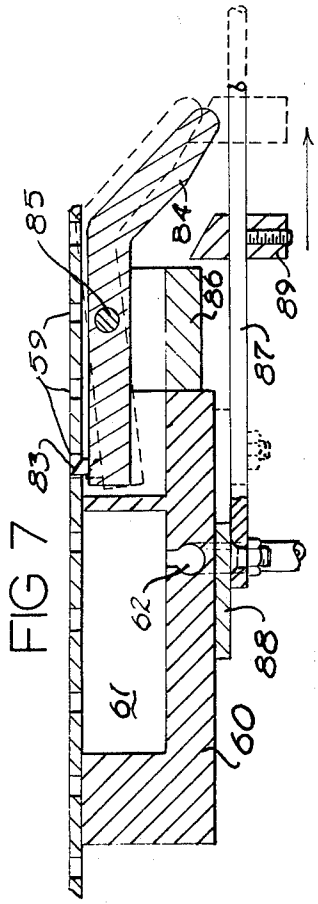


FIG 7

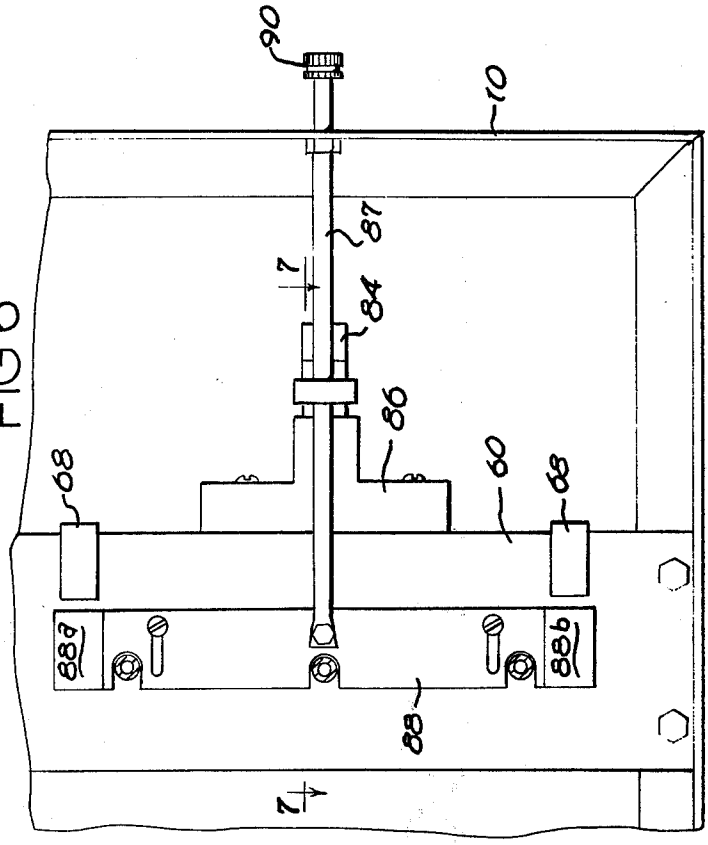


FIG 6

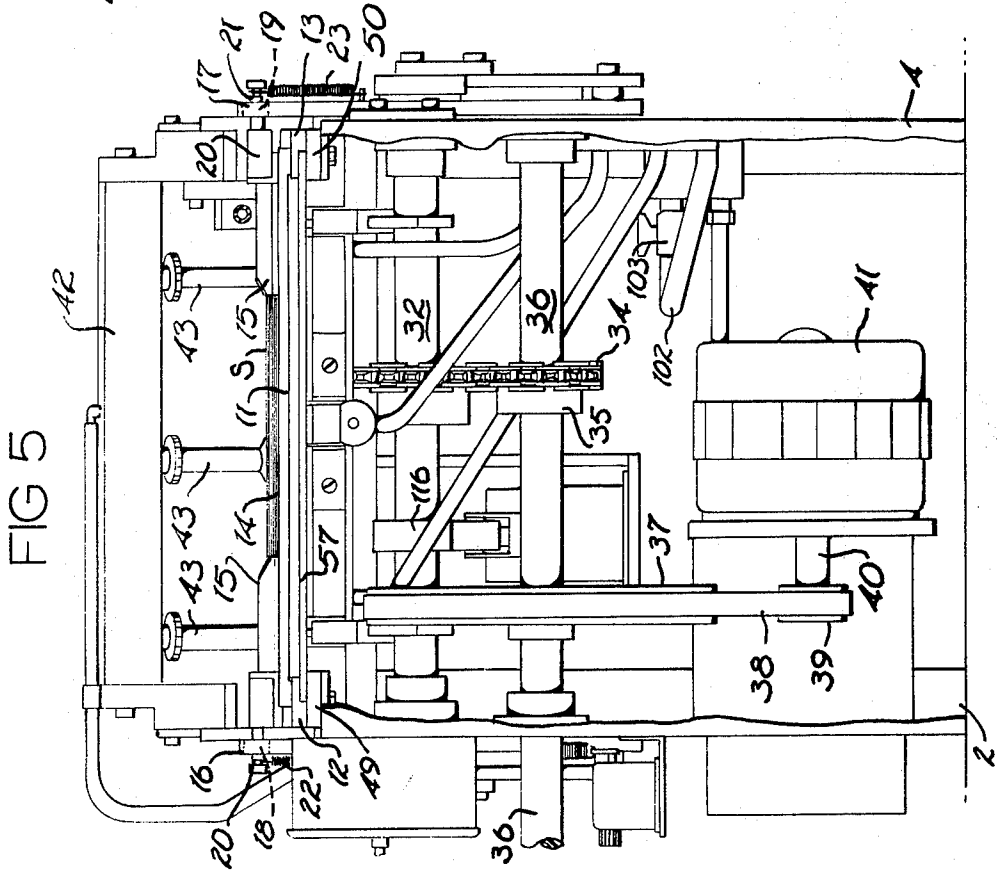


FIG 5

FIG 8

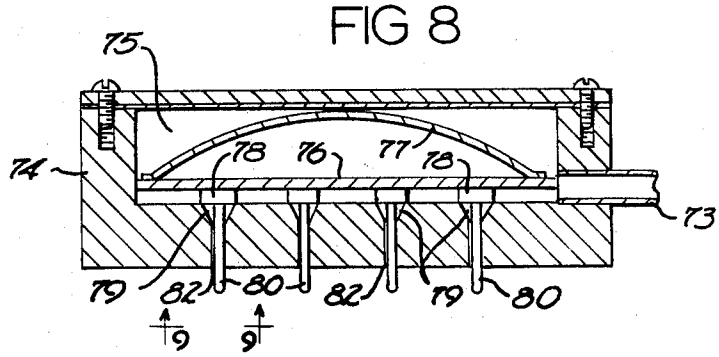


FIG 10

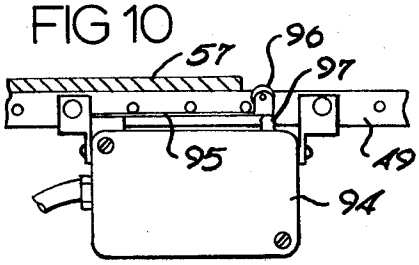


FIG 9

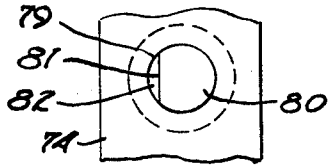


FIG 11

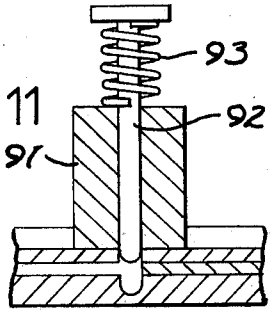


FIG 13

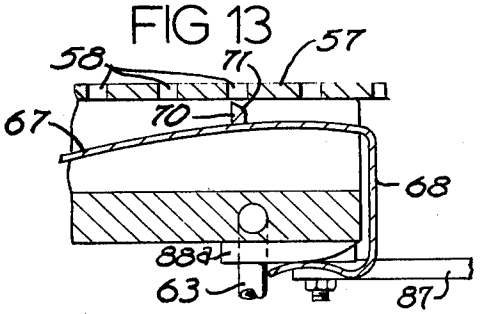


FIG 12

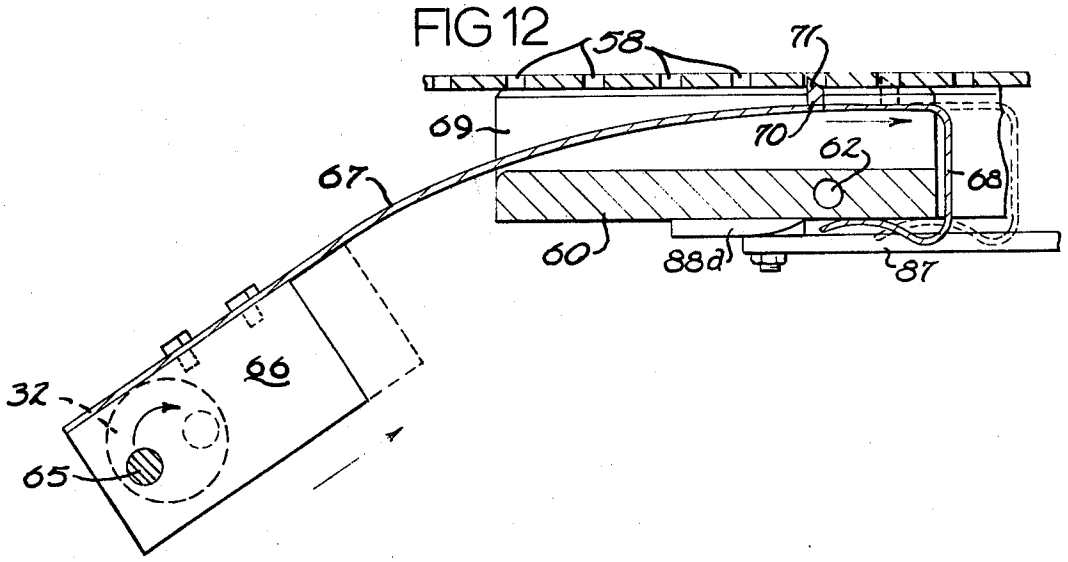


FIG 14

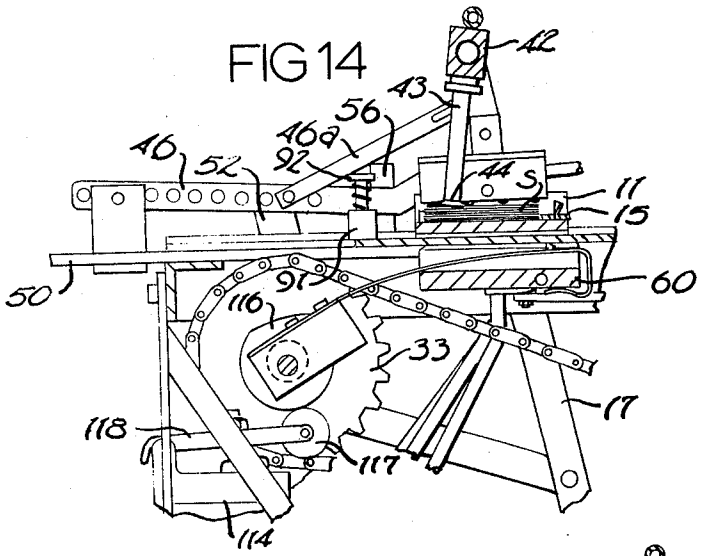


FIG 15

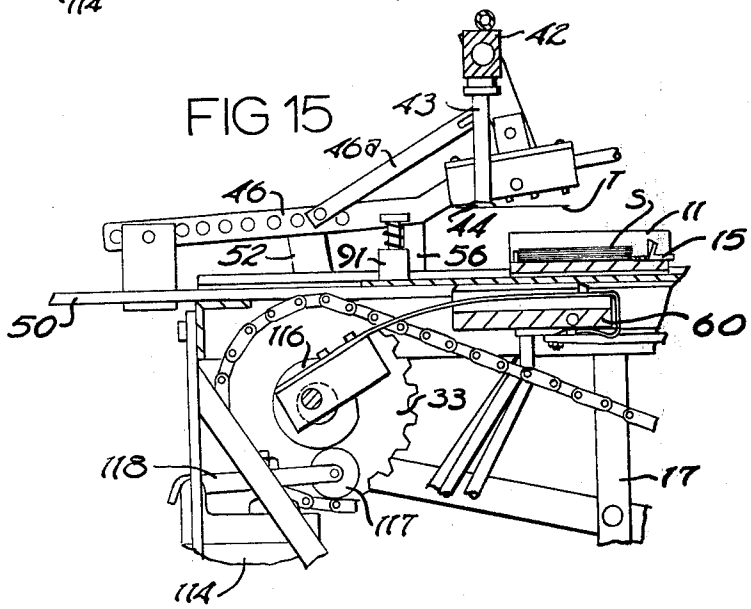
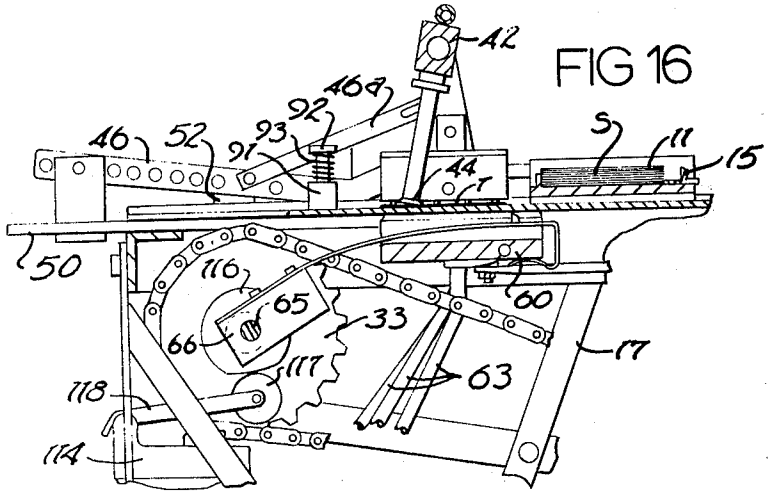


FIG 16



SHEET SHINGLING MACHINE

BACKGROUND OF THE INVENTION

The art of shingling individual like strips of paper, for example checks, receipts, hospital record sheets and the like is well known. The arrangement of strips in this fashion makes it possible to manipulate as a unit an assembly of a series of overlapped sheets. By releasably securing the strips to each other, they may be separated after receiving initial data on the exposed portion of each sheet from, for example, a master sheet by a duplication process that is well known.

Many machines for shingling strips are found among the prior patents. As examples, see U.S. Pat. Nos. to Dusenberry and Warren Nos. 2,816,755, 2,816,756, and 2,873,115. Other prior U.S. Pat. Nos. of which we are aware are the following:

Roethe 2,260,582 Morrison 2,277,924 Paulsen 2,205,433 Marchev 2,222,983 Paulsen 2,476,250 Nelson 2,640,695 Erickson 2,482,613 Williams 2,288,149 Roy 2,712,441 Hess 2,449,776.

While these prior devices have each served their purpose, there remains today a need for a versatile, relatively low cost shingling machine for the small operator.

PURPOSE OF THE INVENTION

It is the purpose of this invention to provide in a strip shingling machine, a combination embodying; a reciprocable support for a stack of strips to be shingled; a suction head movable to and from a position over the support to pick off sheets from the stack thereon; a stationary suction head adjacent to the stack support having means thereover to receive and hold down strips lifted from the stack the said means being advanced step by step between receipt of strips thereon; and a glue applicator on one end of the movable suction head operable to apply glue on the strip at one end while the strip is held down.

BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is a plan view of a shingling machine embodying my invention.

FIG. 2 is a side view of the machine looking at the machine from the line 2—2 of FIG. 1.

FIG. 3 is a sectional view taken on the line 3—3 of FIG. 1.

FIG. 4 is an elevation view of the outlet end of the machine.

FIG. 5 is an elevation view of the inlet end of the machine.

FIG. 6 is an enlarged bottom plan view looking upward from the line 6—6 on FIG. 3.

FIG. 7 is an enlarged sectional view taken on the line 7—7 of FIG. 6.

FIG. 8 is an enlarged fragmentary sectional view taken on the line 8—8 of FIG. 4 illustrating the interior of the glue applicator used in the machine.

FIG. 9 is an enlarged fragmentary detail view looking up at FIG. 8 from the line 9—9.

FIG. 10 is a fragmentary plan view of a stop switch device forming part of the machine.

FIG. 11 is an enlarged sectional view on the line 11—11 of FIG. 4 showing a manual stop device for the plates that carry the shingled sheets through the machine.

FIGS. 12 and 13 are enlarged fragmentary sectional views taken on the line 12—12 of FIG. 1 illustrating the mechanism for advancing the shingled sheet carrying plates in two positions.

FIGS. 14, 15 and 16 are enlarged fragmentary sectional views taken on the line 3—3 of FIG. 1 showing the progessive action in lifting a paper strip from a stack of strips and laying it on the carrier plate.

FIG. 17 is a fragmentary side view of the machine showing a portion of the side opposite that shown in FIG. 2.

GENERAL DESCRIPTION

In the general views shown in FIGS. 1–5 inclusive, the machine is supported upon four legs 1, 2, 3 and 4, which are connected together by side frame members 5 and 6, connecting legs 1 and 2, side frame members 7 and 8 connecting legs 3 and 4, and frame members 9 and 10 connecting legs 2 and 4. The operating parts of the machine are carried by the support consisting of the parts just described.

The operating parts include a strip holder 11 for a stack S of strips of paper. The strip holder 11 is mounted to reciprocate on two side guides 12 and 13 on top of the support. This holder has a locating bar 14 on it against which a stack S of strips T are located (FIGS. 1, 3–5 and 14). The locating bar 14 is backed up by two stop members 15 that are affixed to the holder 11. The strip holder 11 is moved to and fro on the guides 12 and 13 by two lever arms 16 and 17 pivoted respectively to the side frame members 5 and 7. These arms 16 and 17 have enlarged "lost motion" apertures 18 and 19 receiving stub shafts 20 and 21 that are mounted on the ends of the holder 11. Springs 22 and 23 affixed to the stub shafts 20 and 21 and are under tension between these stubs and the arms 16 and 17 so as to press the holder 11 down on the guides 12 and 13.

As shown best in FIGS. 1 and 2, the arm 16 is operated from a bell crank 24 through a link 25, a second link 26, and a control arm 27 pivoted to the leg 1. The arm 17 is operated from a bell crank 28 through a link 29, a second link 30, and a control arm 31. The bell cranks 24 and 28 are driven by a shaft 32, which in turn, is driven through a sprocket wheel 33 from a chain 34. The chain 34 is driven by a sprocket wheel 35 on a shaft 36. The shaft 36 has a pulley 37 thereon that is driven by a belt 38. The belt 38 is driven by a pulley 39 on a shaft 40 of an electric motor 41. The lost motion connection provided between the stub shafts 20 and 21 on the holder 11 and the walls of the apertures 18 and 19 in the arms 16 and 17 provide a dwell period in the movement of the holder 11 at each end of its reciprocating movement.

The strips T are picked off the stack S on the holder 11 by a movable suction head 42 which extends across the machine and which carries a plurality of resilient suction tubes 43. The tubes 43 have cups 44 to pick up the top strip T of the stack S when the holder 11 is in its advanced position as in FIGS. 3 and 14. The head 42 is pivoted on two levers 45 and 46 that are pivoted to brackets 47 and 48 that are mounted on bars 49 and 50 that support the guides 12 and 13. The levers 45 and 46 include slotted brace bars 45a and 46a to limit the rocking movement of the suction head on the levers 45 and 46. The levers 45 and 46 are adjustably secured to depending cam followers 51 and 52 that ride on cams

53 and 54 are affixed to the shaft 32 just inside the bell cranks 24 and 28 and are double-lobed cams so that, for each rotation of the shaft 32, the followers 51 and 52 are raised and lowered twice. Upstanding guides 55 and 56 are mounted on the frame members 6 and 8 to limit transverse movement of the levers.

The angular positioning of the cams 53 and 54 to the bell cranks 24 and 28 respectively on the shaft 32 is such that the cams 53 and 54 lower the movable suction head 42 and its cups 44 on the stack S of strips T while the holder 11 is stationary in the position shown in FIG. 14. Then, as the shaft 32 continues to rotate, the cams 53 and 54 lift the cam followers 51 and 52 to lift the head 42 and the strip T held thereby from the stack S upward before the arms 16 and 17 have exhausted the "lost motion" movement afforded by the apertures 18 and 19. The cams 53 and 54 retain the suction head 42 and its cups 44 with the strip held thereby in elevated position long enough for the holder 11 to move out from under the held strip T. Then the cams allow the suction head 42 to move down to the position shown in FIG. 16.

The strips T are lowered on to carrier 57 which is shown in FIG. 1 to be an apertured plate with several rows 58 and 59 of apertures therein. The plate 57 is movable endwise of the rows 58 and 59 on the bars 49 and 50 beneath the guides 12 and 13 which are recessed as shown in FIGS. 4 and 5 to provide guide channels for the plate 57. The plate 57 is moved along the guide channels to pass over a stationary suction head 60. The suction head 60 has a rectangular recess 61 in the top thereof, for each of the rows 59 so that as the plate 57 passes over the recesses 61, suction can be applied through a plurality of apertures in each row 59 to strips T which overlie the recesses 61. A suction passage 62 extends lengthwise of the head 60 and is connected to the recesses 61 to draw air out of the recesses 61. The passage 62 is connected by air hoses 63 to an air pump 64 of conventional construction. As shown in FIG. 7, the plate 57 supports the strips T so that when a new strip T is laid down by the suction head 42 over the recesses 61, it will cover an aperture in each of the rows 59 and will be held down on the plate 57 so as to move with the plate 57 when it is advanced.

The plate 57 is adapted to be advanced step by step in timed relation to the movements of the suction head 42 by the shaft 32. The shaft 32 has a pair of eccentric portions 65 formed therein, which support bearing blocks 66. A resilient drive arm 67 is secured on each block and extends over the stationary suction head 60. (See FIGS. 1, 3 and 12-16). This arm 67 has an U-shaped free end portion 68 that fits over a portion of the suction head 60, which has a top transverse channel 69 for the arm 67 to move to and fro within. Each arm 67 has an upwardly extended pin 70 thereon provided with a sloping top surface 71. The pin 70 is of a diameter to slide freely into the apertures of the rows 58 of apertures in the plate 57. The top surface 71 has a slope sufficient that when the arm 67 is moved to the right as indicated by the arrows in FIG. 12, the pin 70 slides under the plate 57 depressing the spring arm 67 until the next aperture in the plate 57 is reached. At this point, the spring arm 67 will move the pin 70 into this next aperture. Then the eccentric portion 65 on the shaft 32 moves the arm 67 to the left as seen in FIG. 12. The plate 57 is thus advanced one step for each rotation of the shaft 32. The distance of advance of the plate 57 each time after a strip T is laid on it by the suction cups 44 is thus accurately determined.

Means are provided in the device for adhering the several strips T to each other near one end edge thereof. An adhesive container 72 supplies a liquid adhesive through a flexible tube 73 to a feeder 74 which is mounted on the movable suction head 42 near one end thereof. This feeder 74 is shown in section in FIG. 8 of the drawings. The covered recess 75 of the feeder has a plate 76 therein which is pressed down by a leaf spring 77. Beneath the plate 76 there are a series of valve heads 78 overlying outlets 79 extending to the bottom of the feeder 74. Each head 78 has a finger 80 that extends through the outlet 79 to engage a strip T. As shown by FIGS. 8 and 9 the fingers 80 are flattened at 81 to provide passages 82 alongside the fingers for adhesive to run down the fingers to the tips thereof.

Control of the adhesive flow is accomplished as follows. The heads 78 normally close the outlets 79. When pressure of the tips of fingers 80 upon a strip raises the heads 78, this allows adhesive to flow from the recess 75 down through the passages 82 and to the tips of the fingers 80. The fingers leave small drops of adhesive upon the strip T that they engage. Thus, when the new strip T is laid upon the plate 57, it engages the dots of adhesive upon the strip T that it partially covers. The adhesive causes the shingled strips to stick together so that a group of some 25 or more strips can be handled as a unit.

When the plate 57 is in place beneath the guides there is a possibility that the spring arms 67 could push the plate 57 backward because of friction as the sloping top surface 71 of the pin 70 depresses the arm 67. To avoid this, a bevelled latch pin 83 (FIG. 7) is mounted on a lever 84 which is pivoted on an axle 85 carried by a bracket 86. The bracket 86 is fastened to the suction head 60. The lever 84 normally rests in the position shown in section in FIG. 7, but it can be held down to keep the pin 83 below the path of the plate 57 so the pin 83 will not seat in one of the apertures in the central row 59 of apertures. To hold the lever 84 down in the dotted line position shown in FIG. 7, a hand operated rod 87 has one end secured upon a plate 88 that is slidably secured to the underside of the suction head 60. This rod 87 carries a lifter block 89 to engage the free end of the lever 84. The rod 87 extends through the end frame member 10 and has a knob 90 by which it can be moved endwise to cause the lifter block 89 to hold the lever 84 in release position so a plate 57 can be pulled backward. The plate 88 has end portions 88a and 88b (FIGS. 6, 12 and 13) which engage under the ends 68 of the springs 67 to lower the finger 70 when the rod 87 is pulled back and thus free the plate 57 from the fingers 70.

Th machine has a manual stop member 91 arranged on the guide 13 to extend a pin 92 through the guide 13 to stop the plate 57 in the right position to receive the first strip T to be laid down on the plate 57 when a plate is inserted to receive a series of strips. The pin 92 is normally held raised by a spring 93, and is manually depressed to act as a stop for the plate 57.

A stop switch unit 94 shown in FIGS. 1, 2 and in a fragmentary view FIG. 10 is used to stop the machine when a plate 57 has the series of sheets laid down on it and ready to be removed. The unit 94 is carried on bar 49 and can be set far enough from the stationary section head 60 to allow all of the apertures 59 to be

used in holding down sheets as the plate **57** is advanced. A spring arm **95** on the switch unit **94** carries a roller **96** to be depressed by the advancing plate **57.** The switch unit **94** has a pushbutton **97** benath the spring arm **95.**

The suction hoses **63** all lead to a common passage **101** from which air is withdrawn through a conduit **102** which has a manually operable valve **103** in it. The conduit **102** leads to the air pump **64** which is of conventional construction. The suction head **42** has an air hose **104** leading to a cam operated valve **114.** An outlet conduit **115** connects the valve **114** to the pump **64** to provide the suction necessary to pick up the strips T. The valve **114** is a normally open commercially available valve which is closed by means of a cam **116** on the shaft **32** and a roller **117** upon a lever **118** which actuates the stem **119** of the valve **114.**

The adhesive container **72** preferably has a conduit **105** to apply air pressure on the adhesive therein to effect a force feed of adhesive into the feeder **74.** The adhesive is somewhat viscous and the pressure is needed to move it to the fingers **80** upon lifting of the heads **78.** The conduit **105** as shown has a manual control valve **106** therein. Any source of air pressure such as the air pump **64** can be used.

The machine includes a counting device **107** which registers in a known manner each strip pick-up and transfer movement of the suction head **42.** This counter has a lever **108** that is connected by a resilient link **109** to the connecting pivot **110** for the links **25, 26** and **27.** The counter lever **108** is thus actuated each time the holder **11** is moved beneath the suction head **42.** The machine is equipped with known stop and start switch units **111** and **112** for the pump **64** and the motor **41.**

OPERATION

To initiate the shingling of a series of strips T, a stack S of the strips T is placed on the holder **11** against the locating bar **14.** A carrier **57,** shown as a plate, is placed on the bars **49** and **50** and advanced on the bars, being guided by the side guides **12** and **13** which are secured on the bars **49** and **50** respectively by screws **12s** and **13s** shown in FIG. **1.** The carrier **57** is advanced until it is stopped by engagement with the stop member **91,** which is held down by the operator. Once the carrier **57** is in place, the switch **112** is used to start the motor **41.** The switch **111** is closed before-hand to start the air pump **64.**

The motor **41** causes the operation of shaft **32** and the bell cranks **24** and **28** to cause the links **25, 26, 29** and **30** to actuate the arms **16** and **17** and move the holder **11** beneath the suction head **42** from its position shown in FIGS. **3** and **14.** The double lobed cams **53** and **54** lift the suction head **42** to raised position while the holder **11** is moved. When the holder **11** reaches the position shown in FIG. **14,** it pauses there while the shaft **32** continues to rotate due to the lost motion connection affored by the apertures **18** and **19** in the arms **16** and **17.** The cams **53** and **54** then lower the head **42** to bring the cups **44** down on to the top strip T of the stack S. The cups pick up the top strip as the cams **53** and **54** raise the head **42** so the holder **11** is free to move back to the left as seen in FIGS. **14, 15** and **16.**

As the cups **44** of the suction head **42** descend upon the stack S the adhesive feeder **74** is brought down so the fingers **80** are engaged with the top strip T before it is lifted off the stack S. The strip T gets its spots of adhesive and the fingers stay in contact with the carried strip T long enough to deposit the adhesive thereon.

The head **42** is lowered by the cams **53** and **54** as soon as arms **16** and **17** move the holder **11** out of the way. The strip T is laid on the carrier **57** where the suction through the apertures **59** from the recesses **61** in the suction head **60** holds the strip T on the carrier **57** while the suction head **42** is lifted again. The valve **114** is closed by the cam **116** to cut off the suction from the head **42** temporarily while the head is lifted.

Upon release of the strip T by the cups **44** of the head **42,** the carrier **57** is advanced by the pins **70** which enter into apertures of the rows **58** in the carrier **57** which is located properly by the pin **92.** These pins **70** advance the carrier **57** one step and are then returned by the spring arms **67** and the eccentric portions **65** of the shaft **32.** The latch pin **83** keeps the carrier **57** from being pushed back by the return movement of the pins **70.**

The actions just described are repeated until the carrier plate **57** engages with the switch roller **96** to actuate the stop switch **94.** This complets the securing together of a series of strips T in shingled relation upon the carrier plate.

The invention, in which an exclusive right is claimed, is defined as follows:

1. A sheet shingling machine comprising a supporting framework;

a holder on said framework having a top surface on which a stack of strips to be shingled are supported;

means to reciprocate said holder from a first position to a remote position;

a stationary suction head on said framework over which said holder is located while at said first position;

a movable suction head mounted on said framework for up and down movement over said stationary suction head and operable to lift the top strip from said stack when the holder is over the stationary suction head at said first position and to lower the lifted strip when the holder is moved away from the stationary suction head;

a carrier having a multiplicity of uniformly spaced rows of aperures therein and movable on said framework beneath the holder and over the stationary suction head whereby to place the apertures therein successively in communicative alignment with apertures in said stationary suction head;

means to advance the carrier step by step so that suction from said suction head through its apertures can hold strips lowered on to said carrier by the movable suction head while the movable suction head is raised therefrom; and

means on said framework to secure each strip as it is laid on the carrier to the previously laid strip.

2. The invention defined in claim **1** wherein the means to reciprocate the holder on the framework includes means to cause the holder to dwell temporarily beneath the movable suction head while that head descends upon a top strip on the holder and lifts it.

3. The invention defined in claim **1** wherein the means to secure each strip to the previously laid strip comprises an adhesive applicator on said movable suction head engaged with a strip upon lowering of the movable suction head.

4. The invention defined in claim **1** wherein the means to advance the carrier comprises a pair of spring

arms beneath the carrier and driven by the holder reciprocating means; and

pins on said spring arms engageable in successive apertures in certain of the rows of apertures in the carrier.

5. The invention defined in claim **1** wherein the carrier comprises a plate of rectangular configuration and the framework has guides engaging the side edges of the plate; and

manually releasable means on the framework has a stop pin for preventing the plate from backward movement while it is between the suction heads.

6. A sheet shingling machine comprising:

a supporting framework;

a holder movably mounted to the framework for supporting a stack of sheets such as checks;

drive means for reciprocating the holder between a first position and a remote position along a prescribed path of travel;

sheet feeding means mounted to the framework adjacent said first position of said holder for sequentially gripping and holding the top sheet of the stack while the holder is at said first position and for releasing the sheet while the holder is at said remote position;

said sheet feeding means being comprised of a movable suction head mounted to the framework for upward and downward movement, operable to lift the top sheet from the stack when the holder is in the first position and to lower the lifted sheet when the holder is in the remote position:

a carrier movably mounted to the framework for receiving the sheets released by the sheet feeding means;

means operatively connected between the drive means and said sheet feeding means for causing said upward and downward movement of said suction head in timed relation to movement of said holder between its first and remote positions;

and means on said framework for advancing said carrier a prescribed distance relative to the framework after receiving each sheet released by said sheet feeding means.

7. The machine defined in claim **6** further comprising:

adhesive applying means mounted to the feeding means for applying adhesive to each successive sheet as it is initially gripped while on the top of the stack, whereby each sheet on the carrier is secured to the previously-received sheet.

8. The invention defined in claim **6** wherein the drive means includes means to cause the holder to dwell temporarily beneath the movable suction head while that head descends upon a top sheet on the holder and lifts it.

9. The machine defined in claim **6** wherein said last-named means comprises:

a spring arm adjacent the carrier, driven by said drive means to move in a reciprocating path a distance corresponding to said prescribed distance in timed relation to movement of said holder;

a pin mounted to the spring arm and biased thereby against the carrier;

a plurality of apertures in said carrier in alignment with said pin and reciprocating path thereof, said apertures being spaced apart from one another by said prescribed distance;

said pin having an inclined surface thereon to enable said pin to slide over the carrier while moving in a first direction, in said reciprocating path, engage an aperture at the end of movement in said first direction and remain engaged therein while moving in an opposite direction, and finally disengage from said aperture at the end of movement in said opposite direction to then slide over the carrier toward the next successive aperture, whereby said carrier is advanced by said prescribed distance as said pin moves in said opposite direction.

10. The machine defined in claim **9** wherein the apertures are located along a sheet receiving surface of the carrier and wherein said machine further comprises:

a suction head mounted to the framework below the carrier adjacent said first position of said holder and having a suction aperture therein located in communicative alignment with said apertures in said carrier whereby suction may be applied through the successive apertures to the successive sheets received by the carrier to hold said sheets firmly against the sheet receiving surface.

11. The invention defined in claim **6** wherein the carrier comprises a plate of rectangular configuration and the framework has guides engaging the side edges of said plate; and

manually releasable means on the framework has a stop pin for preventing the plate from backward movement while the pin slides along said carrier in said first direction.

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