United States Patent [19]

Comstock

[11] **3,718,328**

[45] **Feb. 27, 1973**

[54] SHINGLING DEVICE

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[22] Filed: **Feb. 12, 1971**

[21] Appl. No.: **115,009**

[52] **U.S. Cl.**.....**271/20,** 271/26 E, 271/29

[51] **Int. Cl.**.....**B65h 3/08,** B65h 3/30

[58] **Field of Search**.....271/19–21, 23, 271/29, 26, 26 E, 27–28, 11, DIG. 1

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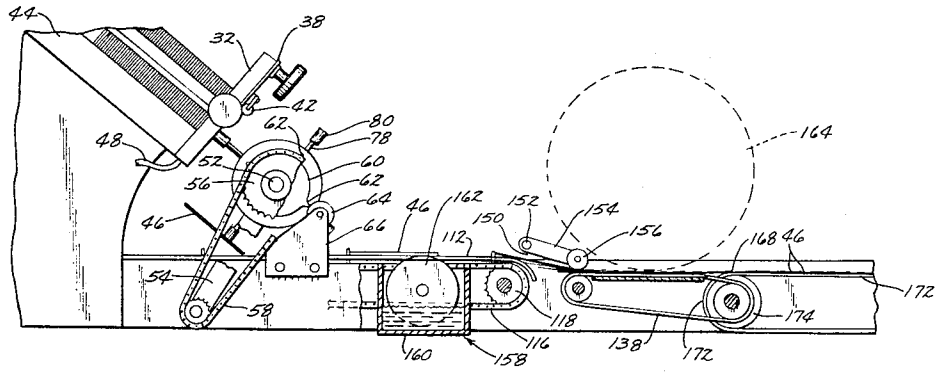
[57] **ABSTRACT**

The shingling device includes a feeder, a rotating hub having grasping members thereon, a first conveyor, and a second conveyor adapted to move more slowly than the first conveyor. The grasping members are adapted to move by the feeder, grasp sheet members from said feeder, and deposit the sheet members on the first conveyor. The first conveyor carries the sheet members to the second conveyor and deposits them on the second conveyor. The sheet members stack up in shingle-like arrangement on the second conveyor because the second conveyor is moving substantially slower than the first conveyor.

9 Claims, 11 Drawing Figures



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SHEET 1 OF 4

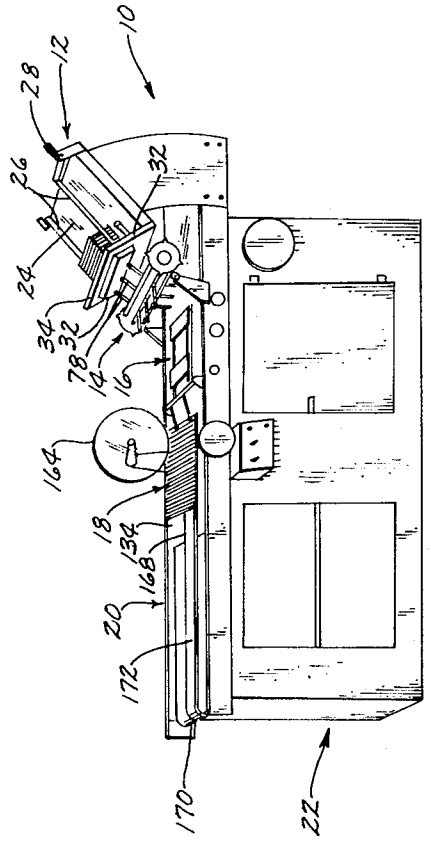

Fig. 1

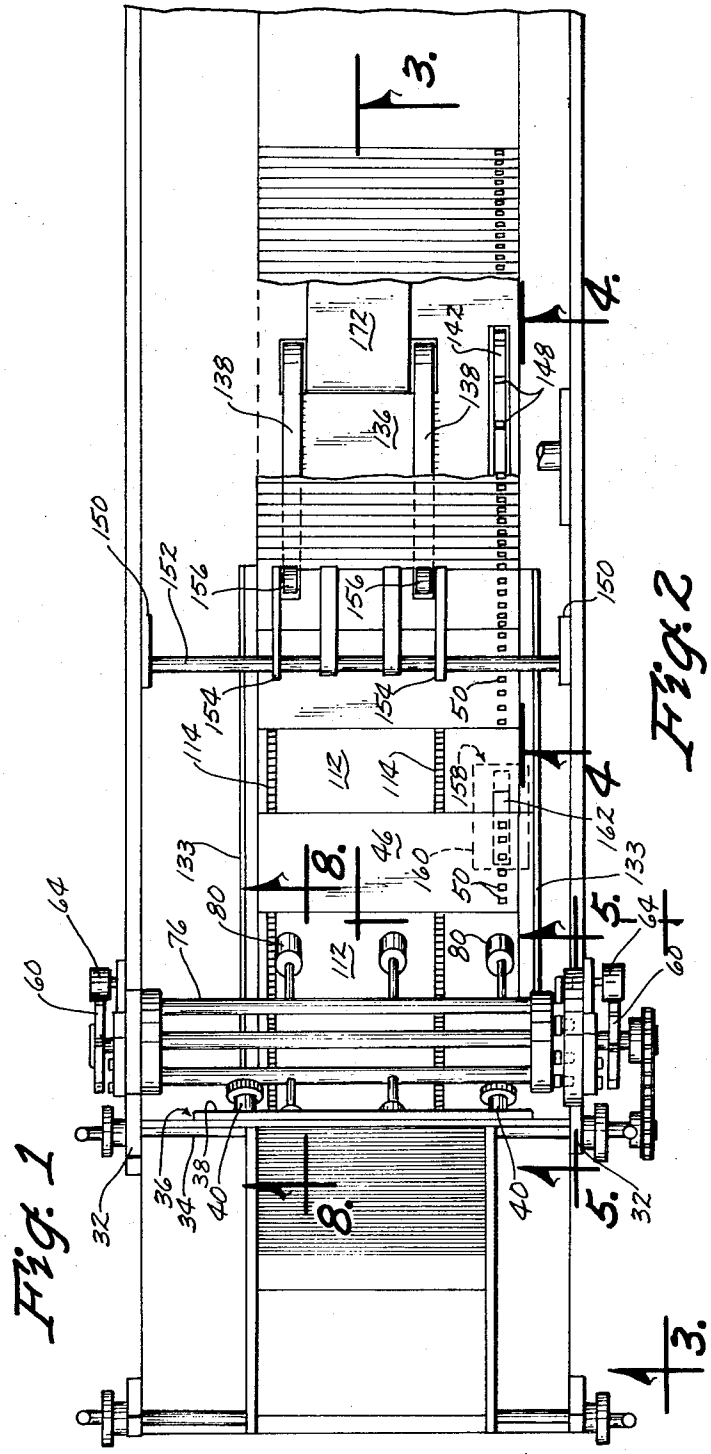

Fig. 2

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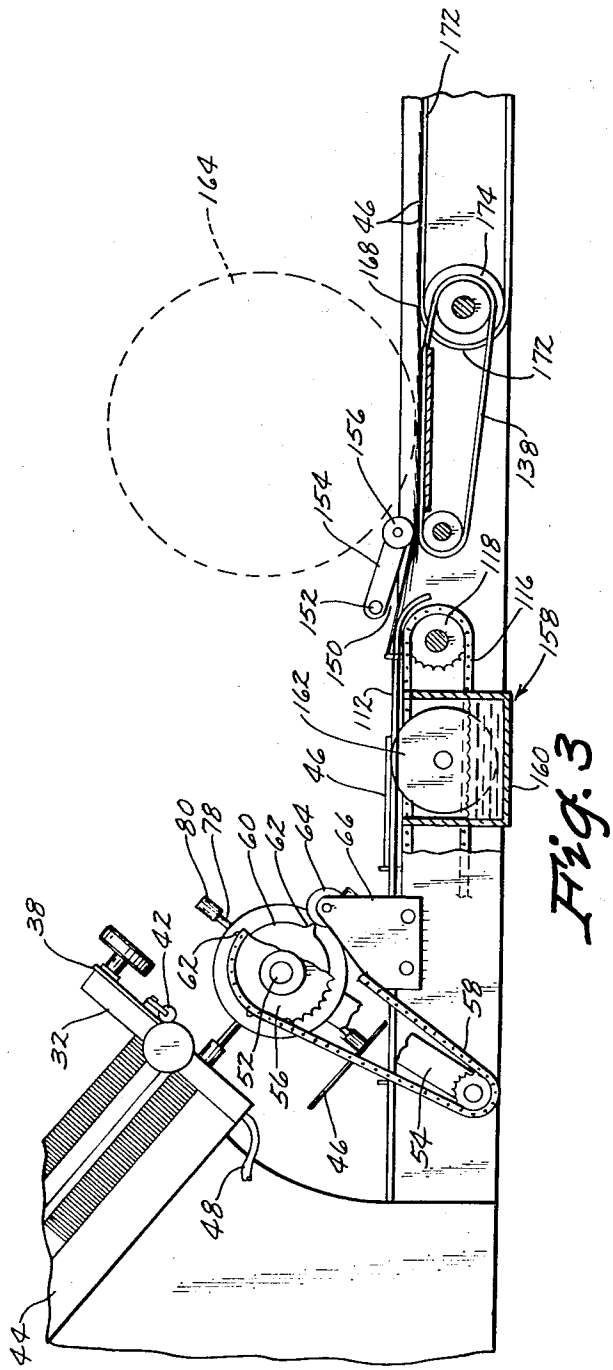

Fig. 3

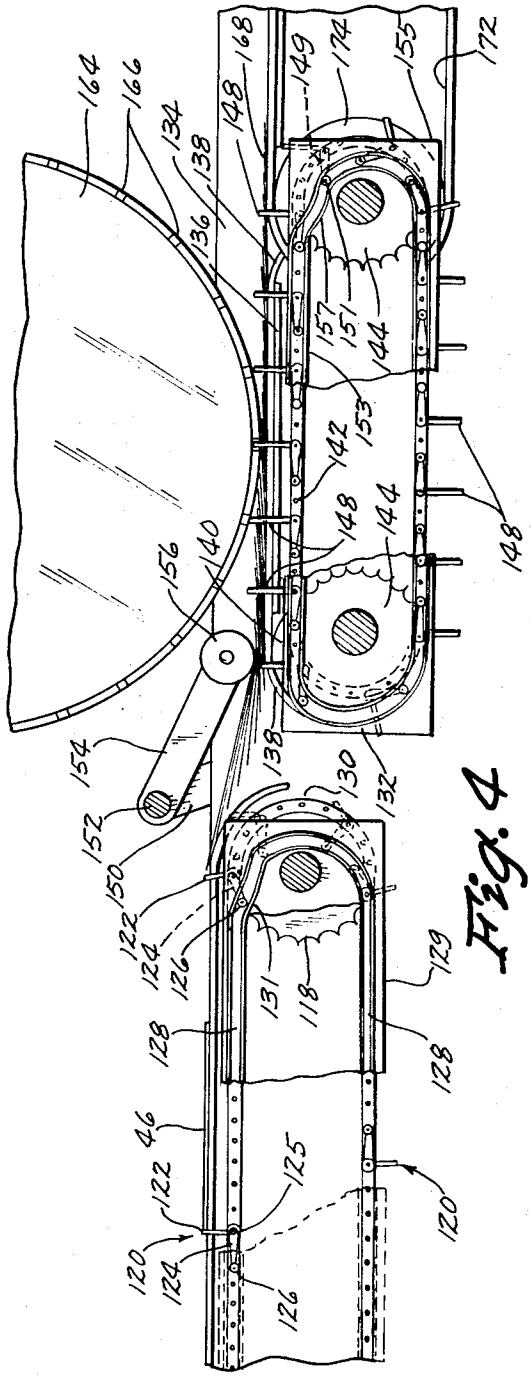

Fig. 4

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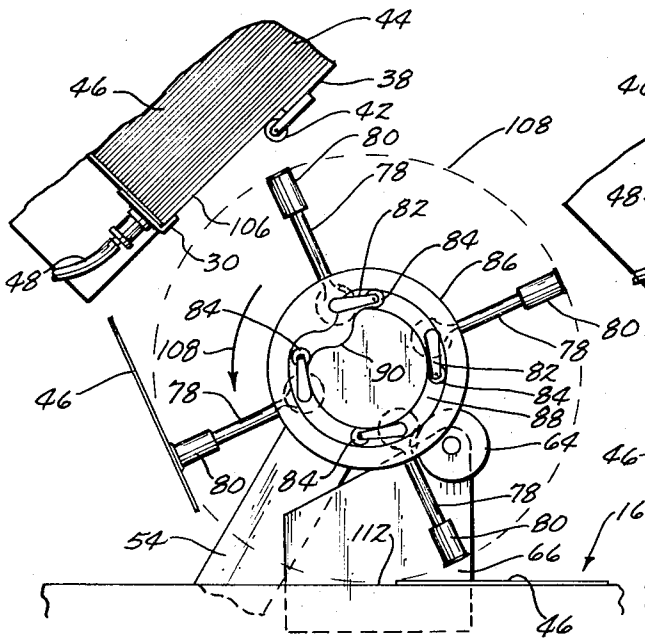

Fig. 5

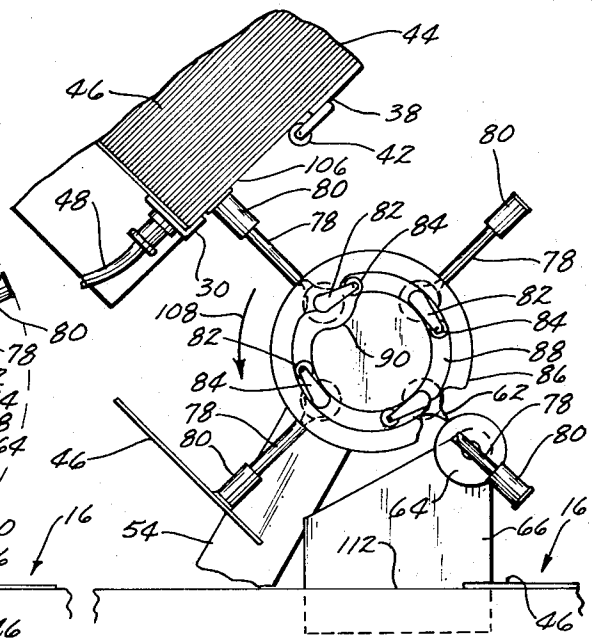

Fig. 6

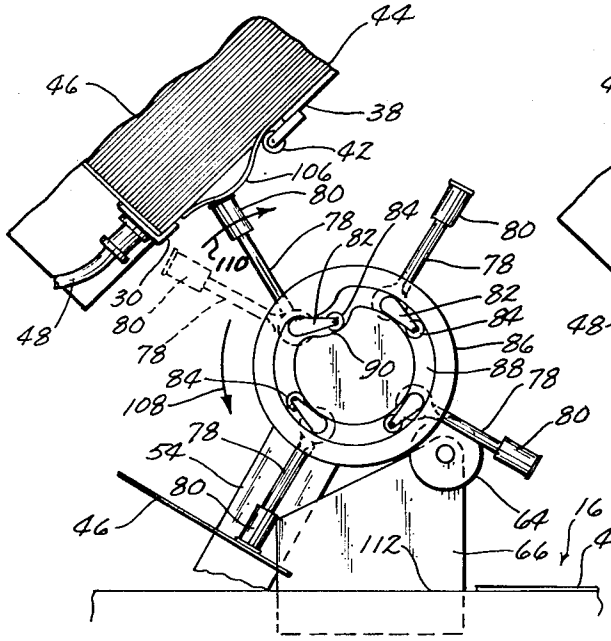

Fig. 7

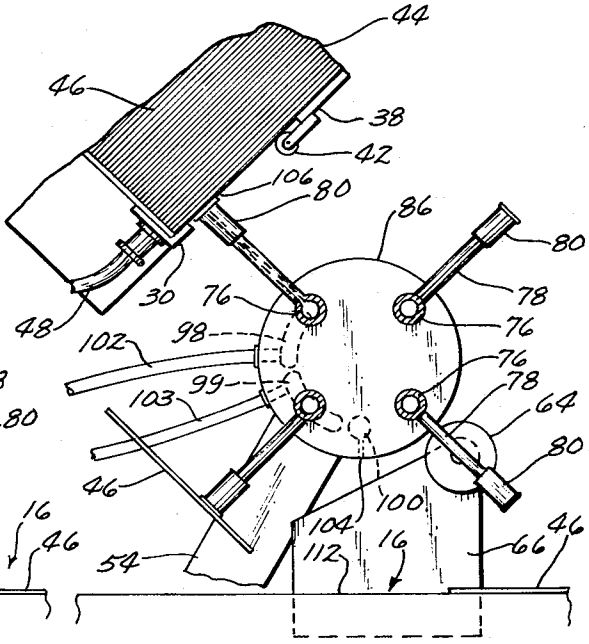

Fig. 8

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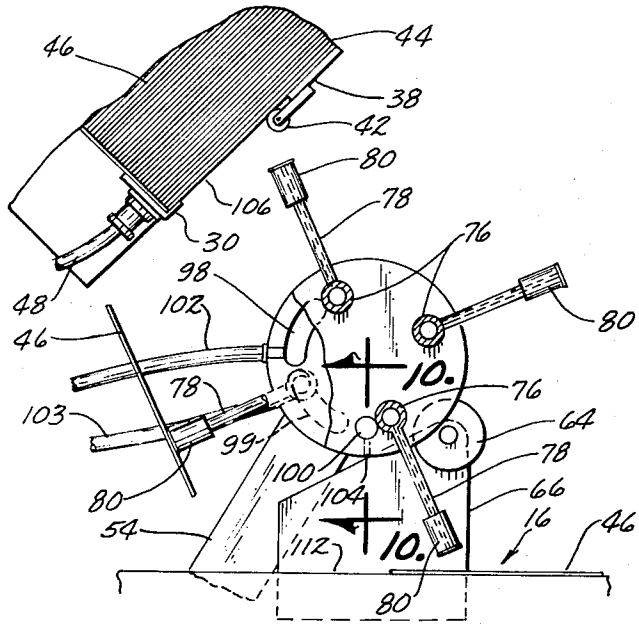

Fig. 9

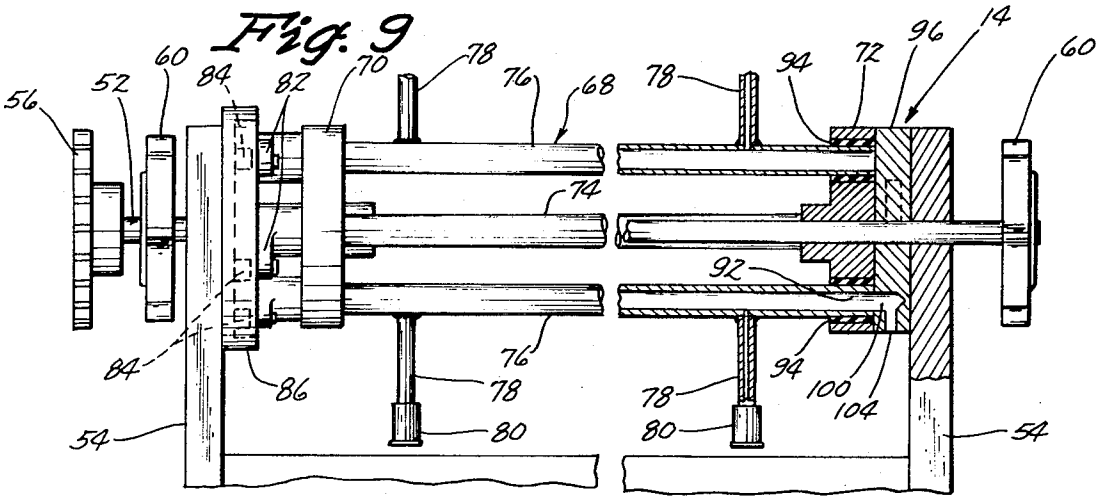

Fig. 10

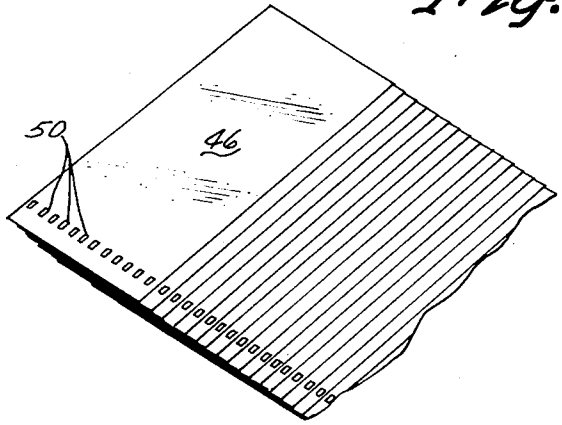

Fig. 11

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SHINGLING DEVICE

This invention relates to the shingling device for arranging a plurality of sheet members in a shingle-like configuration and for securing them together in that configuration.

Many office records, billing records, invoices, and other clerical devices utilize sheets of paper arranged in a shingle-like configuration. Heretofore these configurations have been produced by manually arranging the sheet members and by manually gluing them or otherwise joining them together. The device of the present invention provides a fully mechanized means for arranging and securing these sheet members in a shingle-like arrangement.

Therefore a principal object of the present invention is the provision of a shingling device which fully mechanizes the arrangement and securement of a plurality of sheet members in a shingle-like configuration.

A further object is the provision of a device which will remove sheet members from a hopper one at a time without tearing or damaging them.

A further object is the provision of a device which will arrange the sheet members so that they are uniformly shingled.

A further object is the provision of a device which will apply adhesive to the sheet members and cause them to be joined together automatically without the necessity of manual labor.

A further object is the provision of a device which speeds up the process of shingling sheet members over the speed attained by devices presently being used.

A further object is the provision of a shingling device which is efficient in operation, durable in use, and economical to manufacture.

These and other objects will be apparent to those skilled in the art.

This invention consists in the construction, arrangements, and combination of the various parts of the device, whereby the objects contemplated are attained as hereinafter more fully set forth, specifically pointed out in the claims, and illustrated in the accompanying drawings in which:

FIG. 1 is a perspective view of the shingling device;

FIG. 2 is a top plan view of the shingling device;

FIG. 3 is a sectional view taken along line 3—3 of FIG. 2;

FIG. 4 is an enlarged sectional view taken along line 4—4 of FIG. 2;

FIG. 5 is a sectional view taken along line 5—5 of FIG. 2;

FIGS. 6–9 are sectional views similar to that of FIG. 5, but showing the hub in a plurality of positions during its rotation;

FIG. 10 is a sectional view taken along line 10—10 of FIG. 9; and

FIG. 11 is a perspective view of the sheet members arranged in shingle-like configuration.

Referring to FIG. 1, a shingling device **10** includes a feeder **12**, a hub or spindle **14**, a first conveyor **16**, a second conveyor **18**, and a third conveyor **20**. Shingling device **10** includes a support frame **22** in which are housed the power means and drive apparatus (not shown) for operating the various components of shingling device **10**.

Feeder **12** includes a hopper slide **24** disposed at an oblique inclined angle and provided with adjustable side rails **26** (FIG. 1). A crank handle **28** is provided for adjusting the distance between side rails **26** so as to accommodate sheet members of varying sizes. At the lower end of hopper slide **24** is an upwardly extending lip **30** (FIGS. 5–9). A pair of support legs **32** (FIGS. 1 and 2) extend upwardly from the lower end of hopper slide **24** and a cross bar **34** extends between the upper ends of support legs **32**. Mounted on cross bar **34** for adjustable sliding movement thereon is a hold down assembly **36** best seen in FIG. 2. Hold down assembly **36** includes a slide bar **38** slidably mounted on cross bar **34** and including set screw knobs **40** adapted to be tightened to secure slide bar **38** against sliding movement on cross bar **34**. Also secured to slide bar **38** and extending downwardly therefrom is a pair of rollers **42**. (FIGS. 3–8).

Feeder **12** is adapted to accommodate a deck **44** of paper sheet members **46**. Sheet members **46** are arranged in face to face relationship on hopper slide **24** with the end sheet member **46** at the lower end of deck **44** abutting against lip **30** and roller **42** as can be seen in FIGS. 5–9. At the lower end of hopper slide **24** is a blower tube **48** which is connected to a source of air pressure (not shown) and which is adapted to blow air between the lower sheet members **46** so as to insure that they do not stick together in face to face relationship.

Sheet members **46** are illustrated in FIG. 11 where they are shown in shingled relationship. They are approximately 6–10 inches long and 2 ½–5 inches wide. A plurality of equally spaced apertures **50** are arranged in a line along one of the end margins of each sheet member **46**. While the particular type of sheet member shown in FIG. 11 is the type preferably used with the present invention, other sizes, shapes, and configurations of sheet members could also be shingled by the present device.

Spindle **14** is used for removing sheet members **46** from feeder **12** one at a time and for depositing sheet members **46** on first conveyor **16**. Referring to FIG. 10, spindle **14** includes an axle **52** which is rotatably journaled adjacent its opposite ends in a pair of upstanding swing arms **54**. Swing arms **54** are hinged at their lower ends to support frame **22** (FIG. 3) so that axle **52** will be swingably movable toward and away from the lower end of hopper slide **24**. Fixed to one end of axle **52** is a drive sprocket **56** adapted to receive a drive chain **58** (FIG. 3) which is connected to a drive means (not shown) for causing axle **52** to rotate. Next to drive sprocket **56** is a swing cam **60** (FIG. 10) and a second identical swing cam **60** is mounted on the opposite end of axle **52** from drive sprocket **56**. Each swing cam **60** includes a plurality of cam shoulders **62** (FIG. 3) on its outer radial edge. Cam shoulders **62** are adapted to bear against a swing roller **64** which is rotatably supported on support frame **22** by means of gussets **66**. Thus as axle **52** and swing cams **60** rotate, cam shoulders **62** bear against swing rollers **64** and cause swing arms **54** to swing about their hinged connection to support frame **22**.

Also mounted on axle **52** for rotation therewith is a sucker tube assembly **66** (FIG. 10). Assembly **68** includes a first end member **70** and a second end member **72** which are interconnected by a central tube **74** and a plurality of circumferential tubes **76**. Central tube **74**

surrounds and is operably fixed to axle **52** so that sucker tube assembly **68** will rotate in unison therewith. Each circumferential tube **76** includes three sucker tubes **78** (see FIG. **1**) each extending radially with respect to axle **52** and terminating at its outer end in a sucker mouth **80** (FIGS. **3–9**). Sucker tubes **78** are rigid with respect to circumferential tubes **76**, and circumferential tubes **76** are rotatably mounted at their opposite ends in first and second end members **70, 72**. Circumferential tubes **76** extend completely through first end member **70** and are provided at their ends with a leg **82** (FIGS. **5–7**) having a cam roller **84** rotatably mounted thereon. Rigidly secured to the swing arm **54** adjacent first end member **70** is a cam block **86** (FIG. **10**) having a continuous cam track **88** therein. (FIGS. **5–7**). Cam track **88** is substantially circular except for one dip point **90** located at a predetermined point on its circumference. Cam rollers **84** are rollably guided in cam track **88** and normally hold sucker tubes **78** in a radially extending position such as shown in FIG. **5**. However, when one of cam rollers **84** is guided into dip point **90** such as shown in FIG. **7** it causes sucker tube **78** to pivot away from its radially extending position.

Sucker tubes **78** and circumferential tubes **76** are hollow and are in communication with one another as can be seen in FIG. **10**. The ends of circumferential tubes **76** which protrude within second end member **72** are each provided with an open end **92** surrounded by an annular sealing ring **94**. A valve block **96** is rigidly secured to the one of swing arms **54** adjacent second end member **72**. Valve block **96** includes a first vacuum groove **98** (FIGS. **8** and **9**), a second vacuum groove **99**, and a vent chamber **100** in spaced relation to one another. Vacuum grooves **98, 99** are connected by hoses **102, 103**, respectively, to a vacuum pump (not shown). Vent chamber **100** is in communication with the atmosphere by means of a vent port **104**. The position of vacuum grooves **98, 99** and vent chamber **100** is such that open ends **92** of circumferential tubes **76** move sequentially into communication first with vacuum groove **98**, then with vacuum groove **99**, and then with vent chamber **100** as sucker tube assembly **68** rotates on axle **52**.

The operation of spindle **14** and feeder **12** is best illustrated in FIGS. **5–9**. The point where the end sheet member **46** of deck **44** is held by feeder **12** will be referred to as the pick-up station and is designated in the drawings by the numeral **106**. During rotation of sucker tube assembly **68** sucker mouths **80** of sucker tubes **78** are normally rotating in a circular path designated by the numeral **108** (FIG. **5**). Path **108** is spaced from pick-up station **106**. Sucker tubes **78** are also normally positioned so that they extend radially and are out of communication with a vacuum. As sucker mouths **80** approach pick-up station **106** they first are connected to vacuum groove **98** (FIG. **9**) so that a sucking action is commenced at sucker mouths **80**. Next cam shoulders **62** of swing cam **60** engage swing rollers **64** so as to cause swing arms **54** to move towards pick-up station **106** (FIG. **6**). This camming action urges sucker mouths **80** into grasping engagement with sheet member **46** at pick-up station **106**. At the moment that sucker mouths **80** engage sheet member **46**, cam rollers **84** begin riding into dip point **90** of cam track **88** (FIG. **7**). This causes sucker tubes **78** to pivot in a direction opposite from that in which sucker tube assembly **68** is rotating. The movement of sucker mouths **80** is actually reversed so that they move upwardly as indicated by arrow **110** in FIG. **7**. This causes sheet member **46** to be lifted upwardly over lip **30** so that it is freed from feeder **12**. By this time cam shoulder **62** is riding off swing roller **64** and sucker mouths **80** are swung away from pick-up station **106** so that they remove sheet member **46** from the vicinity of pick-up station **106**. Sucker mouths **80** continue along path **108** until open end **92** of circumferential tube **76** comes into communication with vent chamber **100** whereupon the sucking action of sucker mouths **80** is ceased and sucker mouths **80** release sheet member **46**. The use of two separate vacuum chambers **98, 99** prevents venting of chamber **98** when tube **76** comes into communication with vent chamber **100**.

First conveyor **16** is positioned adjacent spindle **14** and includes a slide plate **112** (FIG. **2**) positioned so as to receive sheet member **46** when it is released from sucker mouths **80**. A pair of parallel spaced apart slots **114** are provided in slide plate **112** (FIG. **2**). Aligned below slots **114** are a pair of continuous conveyor chains **116** which are trained around a pair of conventional sprockets **118** (FIGS. **3** and **4**). Mounted on chains **116** in spaced relation are a plurality of L-shaped dogs **120** each having an upstanding leg **122** and a control leg **124**. Dogs **120** are pivotally connected to chains **116** at the junctures **125** between legs **122, 124**. On the end of control leg **124** is a cam follower **126** which is slidably or rollably guided in a cam track **128** shown in FIG. **4**. Cam track **128** is formed in a cam plate **129** (FIG. **4**). Cam track **128** follows the same path as chain **116** with the exception of the end **130** where chain **116** passes downwardly over sprocket **118**. At this point cam track **128** forms a tip point **131** wherein it causes control leg **124** to tip upstanding leg **122** rearwardly from a vertical position as illustrated in FIG. **4**. A pair of spaced apart guide rails **133** (FIG. **2**) are provided on first conveyor **16** for guiding sheet members **46** thereon.

Second conveyor **18** is positioned in a plane slightly below the plane of first conveyor **16** and includes a first end **132** adjacent end **130** of first conveyor **16** and a second end **134** spaced from first conveyor **16**. Second conveyor **18** includes a flat slide plate **136** for supporting sheet members **46**. A pair of conveyor belts **138** are trained around a pair of belt pulleys **140** and slidably pass over the upper surface of slide plate **136** (FIGS. **2–4**). A chain **142** is trained around a pair of sprockets **144**, and includes a plurality of spaced pins **148** thereon which protrude upwardly above the upper surface of slide plate **136**. Chain **142** is in a predetermined adjusted position with respect to first conveyor **16** so that it will be in registered alignment with the line of apertures **50** in sheet member **46** as sheet members **46** leave first conveyor **16** (see FIG. **2**). Pins **148** are spaced so as to register with every fourth aperture **50** in sheet members **46**.

Referring to FIG. **4**, each pin **148** is provided with a transverse leg **149** having a roller **151** on the end thereof. Rollers **151** are guided within a cam track **153** in a cam plate **155** in the same manner as rollers **126** of first conveyor **16** are guided within cam track **128**. Cam track **153** includes a tip point **157** similar to tip

point 131 of first conveyor 16. Tip point 157 causes pins 148 to maintain their vertical orientation as they pass downwardly over sprocket 146 at the far end of second conveyor 18, thereby preventing tearing of sheets 46 as pins 148 slide downwardly out of apertures 50.

Extending upwardly from support frame 22 at a point between first and second conveyors 16, 18, are a pair of spaced apart stubs 150, (FIGS. 2–4) and extending between the upper ends of stubs 150 is a nip roller shaft 152. Mounted on shaft 152 are a pair of nip roller arms 154 having nip rollers 156 on their outer ends. Arms 154 are either pivotally mounted on shaft 152 or they can be rigidly mounted on shaft 152 with shaft 152 rotatably journaled in stubs 150. In either case arms 154 are swingable so that nip rollers 156 can move toward and away from slide plate 136 of second conveyor 18. Spring or bias means (not shown) yieldably urge nip rollers towards slide plate 136.

First conveyor 16 includes a glue applicator 158 including a glue reservoir 160 and a wheel 162 (FIGS. 2 and 3). Applicator 158 is positioned below slide plate 112 of first conveyor 16 with the uppermost margin of wheel 162 protruding a short distance above the upper surface of sliding plate 112 in registered alignment with the line of apertures 50 in sheet members 46 as they are carried by first conveyor 16. The lower margin of wheel 162 protrudes within glue reservoir 160 and is bathed by a glue or other liquid adhesive substance. Means are provided (not shown) for rotating wheel 162 so that it will apply the liquid glue or adhesive substance to the edges of sheet members 46 adjacent apertures 50.

A press wheel 164 is mounted above second conveyor 18 and engages the upper surface of sliding plate 136 of second conveyor 18. Press wheel 164 is provided with a plurality of spaced apertures 166 around its peripheral margin (FIG. 4). Apertures 166 are spaced to register with pins 148 so that operation of chains 140 causes pins 148 to engage press wheel 164 and rotate it.

Referring to FIGS. 1, 3, and 4, third conveyor 20 is positioned adjacent second end 134 of second conveyor 18 and with its opposite end 170 spaced from second conveyor 18. Third conveyor 20 is comprised basically of a wide continuous belt 172 trained around sets of rollers 174.

In operation spindle 14 picks up sheet members 46 from feeder 12 and deposits them one at a time on first conveyor 16 in the manner described above. Upstanding legs 122 of dogs 120 engage and carry sheet members 46 along above slidable plate 112 of first conveyor 16 as illustrated in FIGS. 1 and 2. Referring to FIG. 4, each sheet member 46 is pushed along by dogs 120 until it reaches end 130 of first conveyor 16. As dogs 120 approach end 130, they are tilted rearwardly a short distance by the action of cam follower 126 in cam track 128. This rearward tilting prevents upstanding legs 122 from tilting forwardly as they pass around sprockets 118, thereby causing sheet members 46 to be gently shoved or pushed off end 130 of first conveyor 16 into nip rollers 156.

Because of the somewhat lower position of second conveyor 16, sheet members 46 tilt downwardly and come to rest on the forward end of sliding plate 136 when they are pushed off the end of first conveyor 12. The pushing action of dogs 120 pushes sheet members 46 under nip rollers 156. Their forward movement is then resumed by their contact with moving conveyor belts 138. Nip rollers 156 engage the upper surfaces of sheet members 46 thereby urging them into frictional driving engagement with conveyor belts 138 of second conveyor 18.

As the sheet advances by the action of the conveyor belts 138 and the nip rollers 156, pins 148 enter every fourth aperture 50 of sheet members 46 so as to position and hold sheet members 46 in a predetermined position on second conveyor 18.

The speeds of first conveyor 16 and second conveyor 18 are set so that first conveyor 16 carries sheet members approximately four times as fast as second conveyor 18. The result of these relative speeds is that sheet members 46 are stacked up in overlapping shingle-like arrangement when they are deposited on second conveyor 18 by first conveyor 16. Since the under surfaces of sheet members 46 are coated with adhesive they tend to stick together as they are deposited in overlapped position on second conveyor 18. Nip rollers 156 and pins 148 also contribute to holding sheet members in alignment as they are carried by second conveyor 18. As the shingled sheet members pass under press wheel 164 they are pressed together at the point where their glued surfaces are in contact.

After the sheet members 46 pass under wheel 164, they are picked up by third conveyor 20 and are carried away. Pins 148 slide downwardly out of sheet members 46 as sheet members 46 are transferred to third conveyor 20.

Thus it can be seen that the device accomplishes at least all of its stated objectives.

I claim:

1. A device of the class described comprising:

a frame;

a sheet feeder for holding a plurality of sheet members, said feeder presenting one of said sheet members in a predetermined orientation at a pick-up station;

a spindle support means movably mounted on said frame for movement toward and away from said pick-up station;

a spindle rotatably mounted on said spindle support means, said spindle including at least one sucker member having a sucker mouth, said spindle being positioned with respect to said pick-up station so that said sucker mouth passes adjacent said one face of said one sheet member when said spindle rotates;

vacuum means for withdrawing air from said sucker mouth;

valve means for connecting said vacuum means to said sucker member when said sucker mouth is adjacent said pick-up station so that said sucker mouth will grasp and hold said one sheet member, said valve means being adapted to disconnect said sucker member from said vacuum means when said sucker mouth is spaced from said pick-up station whereby said sucker mouth will release said one sheet member; and

spindle control means associated with said spindle for moving said spindle toward and away from said pick-up station.

2. A device according to claim 1 wherein said sucker member has an inner end hinged to said spindle for swinging movement about an axis approximately parallel with respect to the rotational axis of said spindle; control means engaging said sucker member for causing said sucker member to swing with respect to said spindle as said sucker mouth passes by said pick-up station.

3. A device according to claim 2 wherein said control means is a cam track stationarily mounted with respect to said frame; said inner end of said sucker member including a cam follower guided within said cam track; said cam track and said cam follower being arranged with respect to one another so that said sucker member swings in a direction opposite from the rotational direction of said spindle when said sucker mouth passes adjacent said pick-up station.

4. A device according to claim 1 wherein said valve means includes a stationary member and a movable member, said stationary member including a vacuum chamber adjacent said pick-up station and a vent port spaced from said pick-up station; said vacuum chamber being connected to said vacuum means and said vent port being in communication with the atmosphere; said movable member being in communication with and carried in unison with said sucker member; said movable member moving successively into communication with said vacuum chamber and said vent port when said spindle rotates.

5. A device according to claim 1 wherein said spindle control means comprises a first camming surface on said spindle and a second camming surface mounted on said frame, said first and second camming surfaces camming against one another during rotation of said spindle.

6. A device according to claim 5 wherein said first camming surface rotates in unison with said spindle.

7. A device of the class described comprising:

a frame;

a sheet feeder for holding a plurality of sheet members, said feeder holding said sheet members in face to face relationship and presenting one face of one of said sheet members in a predetermined orientation at a pick-up station;

a spindle rotatably mounted with respect to said frame between a pair of arms, said arms being swingably mounted to said frame;

a first camming surface being mounted on said frame;

a second camming surface being on said spindle for rotation in unison therewith;

said first and second camming surfaces bearing against one another for causing controlled swinging movement of said arms with respect to said frame during rotation of said spindle whereupon said rotational axis of said spindle moves toward and away from said pick-up station in a predetermined pattern during rotation of said spindle,

said spindle including at least one sucker member having a sucker mouth, said spindle being positioned with respect to said pick-up station so that said sucker mouth passes adjacent said one face of said one sheet member when said spindle rotates;

vacuum means for withdrawing air from said sucker mouth; and

valve means for connecting said vacuum means to said sucker member when said sucker mouth is adjacent said pick-up station so that said sucker mouth will grasp and hold said one sheet member, said valve means being adapted to disconnect said sucker member from said vacuum means when said sucker mouth is spaced from said pick-up station whereby said sucker mouth will release said one sheet member.

8. A frame;

a sheet feeder for holding a plurality of sheet members, said feeder holding said sheet members in face to face relationship and presenting one face of one of said sheet members in a predetermined orientation at a pick-up station;

a support means movably mounted on said frame for movement with respect to said pick-up station;

a spindle rotatably mounted on said support means, said spindle including at least one grasping member having grasping means adapted to grasp and hold said one sheet member; said spindle being positioned with respect to said pick-up station so that said grasping means passes adjacent, engages, and grasps said one face of said one sheet member during rotation of said spindle;

a first camming surface on said spindle;

a second camming surface on said frame;

said first and second camming surfaces bearing against one another to cause movement of said support means toward and away from said pick-up station in a predetermined pattern with respect to rotation of said spindle;

said grasping member having an inner end hinged to said spindle for swinging movement about an axis approximately parallel to the rotational axis of said spindle, said grasping means being held radially outwardly from said inner end of said grasping member; and

control means engaging said grasping member for causing said grasping member to swing in a direction opposite from the rotation of said hub as said grasping means passes adjacent said pick-up station so as to cause lost motion as said grasping means grasps said sheet member.

9. A device according to claim 8 wherein said control means is a cam track mounted stationarily with respect to said frame; said inner end of said grasping member including a cam follower guided within said cam track.

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