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WORKPIECE STACKING DEVICES

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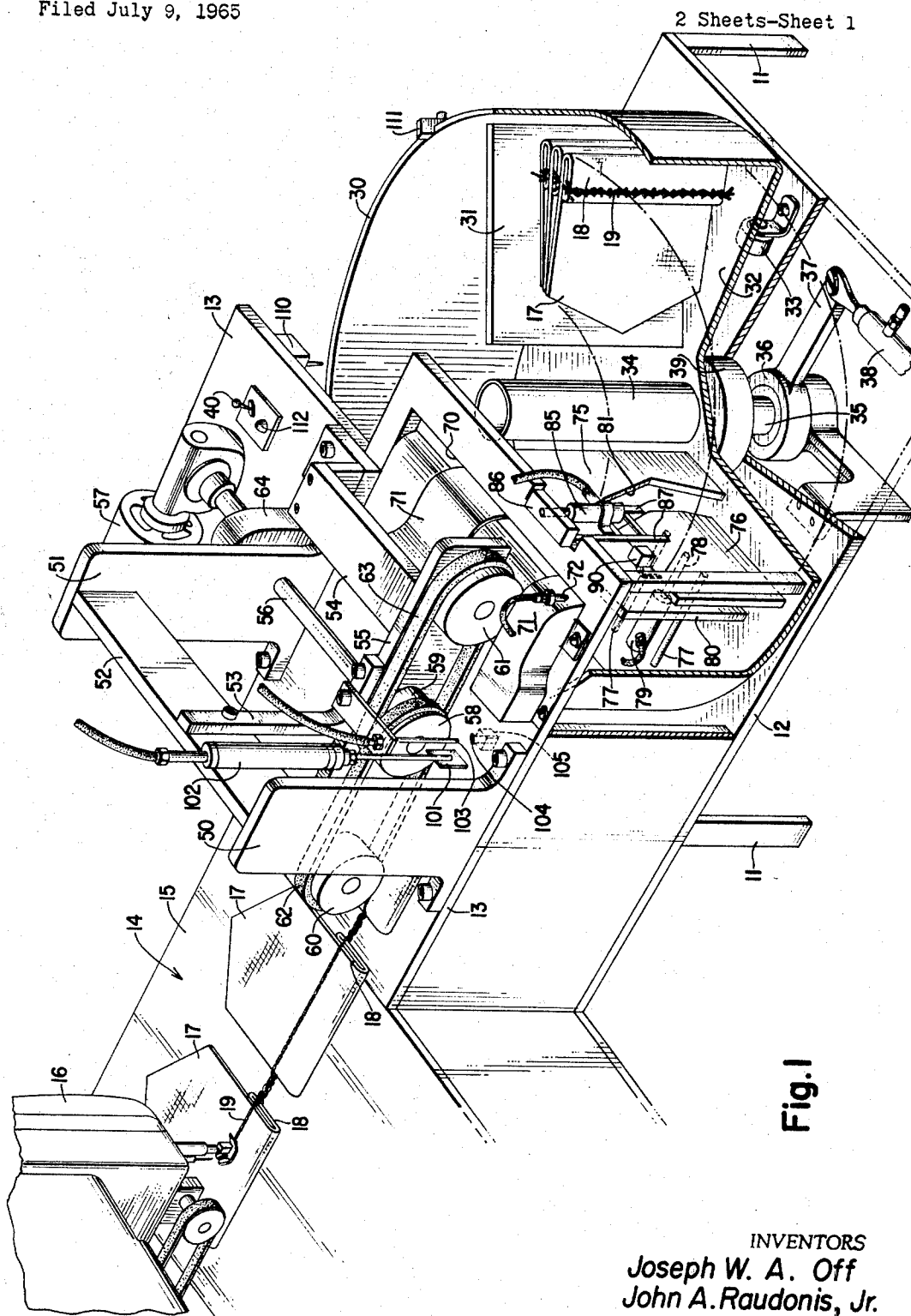


Fig. 1

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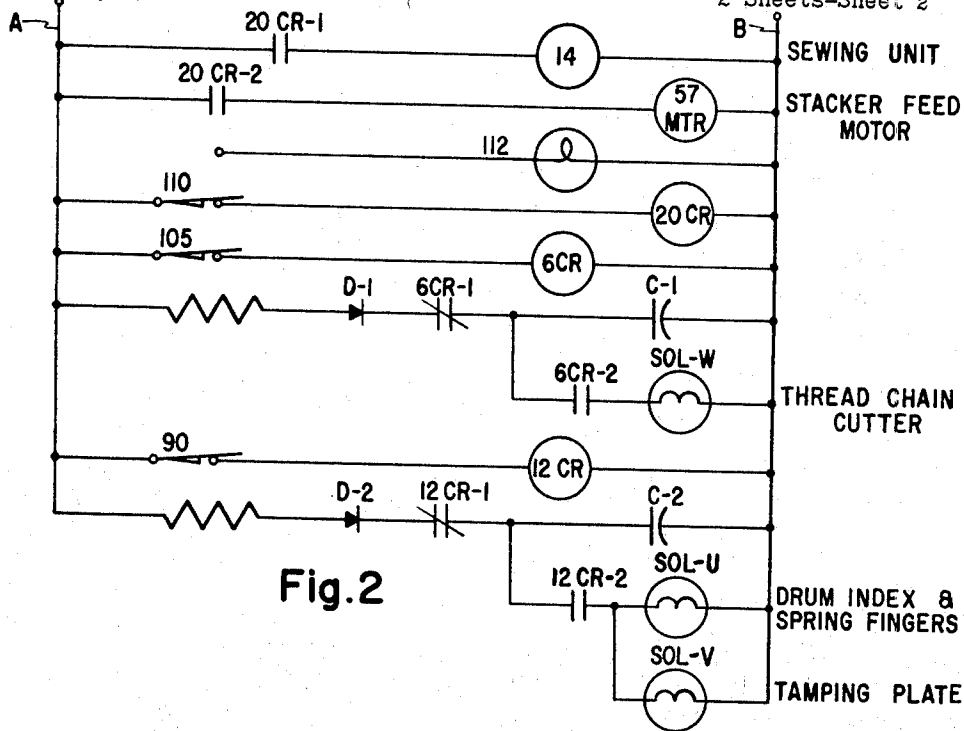


Fig. 2

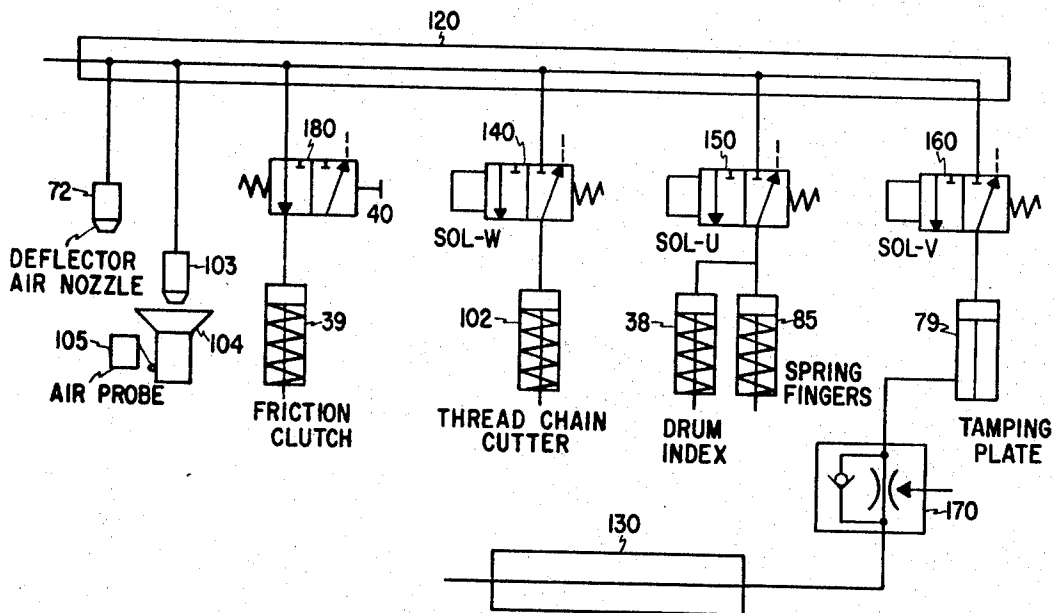


Fig. 3

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1

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WORKPIECE STACKING DEVICES

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ABSTRACT OF THE DISCLOSURE

A stacking device for fabric articles is disclosed in which the fabric articles are arranged edgewise in the stack. The device stacks the fabric articles in annular array in a cylindrical drum thereby to accommodate articles of tapered thickness in a minimum of space.

This invention relates to fabric handling apparatus, and more particularly to a novel and improved device for automatically stacking textile workpieces.

In the art of fabrication of textile articles, the need frequently arises for the transfer of fabric panels, garment subassemblies, and the like from one to another operating or assembly station. In the art, equipment is becoming increasingly available for automatically processing such panels or subassemblies. In contrast to an operator tended machine in which the operator may take successive workpieces from a haphazardly arranged pile or bundle, such automatic processing units almost invariably require that workpieces be presented thereto in an orderly prearrangement, such as an aligned stack. It therefore becomes important to provide mechanism for receiving and arranging or stacking fabric articles from one operating unit so they may be transported in prearranged groups to succeeding automatic operating units.

Stacking devices are known in the art which simply deposit successive workpieces vertically one upon another. Where the fabric pieces or subassemblies are tapered and particularly where the pieces are thicker at one side than at the other, the known stacking devices will not suffice since the stack quickly becomes skewed and will thus fail to accommodate workpieces in predetermined arrangement.

It is an object of this invention to provide a device for receiving individual fabric panels or subassemblies of irregular shapes or tapered thickness and orienting such panels in an orderly prearrangement suitable for transportation as a group for subsequent processing.

It is also an object of this invention to provide a stacking device for textile workpieces which maintains a compact stack making efficient utilization of available space yet arranging the stack in a convenient position for subsequent handling.

A further object of this invention is to provide a device of the above character which may be applied to any known fabric processing apparatus such as a sewing unit and which operates automatically in response to the emergence of the fabric panels or subassemblies from the fabric processing apparatus.

With the above and additional objects and advantages in view, as will hereinafter appear, this invention comprises the devices, combinations and arrangements of parts hereinafter described and illustrated in the accompanying drawings of a preferred embodiment in which:

FIG. 1 represents a perspective view of the stacking device of this invention illustrated as applied to a sewing unit and with portions of the stacking unit broken away more clearly to illustrate the construction,

FIG. 2 is a wiring diagram illustrating the control circuitry for the stacking device of this invention, and

2

FIG. 3 is a diagrammatic representation of the pneumatic system of the stacking device of this invention.

Referring to FIG. 1 of the drawings, 11 indicates the legs of a stand supporting a lower platform 12 and an upper platform 13 of the stacking device of this invention. The lower platform sustains a container in which workpieces are deposited in orderly prearrangement, while the upper platform 13 sustains devices for controlling stacking of workpieces into the container as will be described in detail hereinbelow.

Preferably, the upper platform 13 is arranged at an elevation corresponding to that of an operating unit 14 from which workpieces to be stacked will issue. As illustrated in the drawings, such operating unit may comprise a sewing unit including a support 15, upon which work fabrics are sustained and one or more sewing machines 16.

In the arrangement illustrated, the workpieces may comprise one or more fabric plies such as the ply 17 formed with a hem fold 18 along one edge, the hem fold being secured by a stitched seam 19. These workpieces, until they clear the stitching point of the sewing machine, are propelled from the sewing machine toward the stacking unit of this invention by a work transporting means associated with the sewing machine. Since in the preferred embodiment the workpieces are each tapered in thickness, having the folds of the hem at one edge and only a single non-hemmed ply at the opposite edge, a linear stack, if attempted, would soon become unstable with resulting slippage and distortion of the desired orientation.

The stacking unit of this invention orients the textile workpieces each in a vertical position in face-to-face contact with each workpiece resting on at least one edge. Preferably the workpieces are accumulated within a circular upwardly open drum 30 and against a vertical radially extending partition plate 31 which is secured to the bottom 32 of the drum. The drum 30 is supported on spaced rollers 33 carried on the lower platform 12 on which rollers the bottom of the drum engages. A central shaft 34 in the drum includes a depending portion 35 which is journaled in the lower platform and which carries a sprag type one-way clutch 36 with an associated operating arm 37 pulsed by an air operated spring returned piston 38 to index the drum in step-by-step increments in a counterclockwise direction, as viewed in FIG. 1. Such indexing of the drum is accomplished, as will be described in detail hereinbelow, in a manner automatically correlated with the delivery of workpieces to the drum so that the partition plate will maintain the workpieces in vertically oriented arrangement as the drum is gradually filled with workpieces. Also associated with the drum shaft portion 35, is an air operated friction clutch 39 which may be rendered selectively effective or ineffective, by a control element 40, carried preferably on the upper platform 13. During stacking operation, the friction clutch 39 is rendered continuously effective and although it is overpowered by the sprag type clutch, the friction clutch serves to prevent overspinning of the drum during indexing as well as to prevent inadvertent clockwise displacement of the drum. When workpieces are removed from the drum, the friction clutch may be rendered ineffective while the drum is turned manually in a clockwise direction to return the partition plate 31 into position maintaining the workpieces vertically.

Extending upwardly from the upper platform 13, are a pair of standards 50, 51 with an elevated crosspiece 52 extending therebetween. Sustained at a level above the upper platform by a bracket 53 on the crosspiece 52 and by a lateral arm 54 extending from the standard 51, is an elongate vertical feed supporting plate 55. A shaft 56 journaled in the feed supporting plate 55 and in the

vertical standard 51, is driven by a gear motor 57 on the upper platform and carries two pulleys 58 and 59 adjacent to the vertical feed supporting plate. Idler pulleys 60 and 61 carried on the feed supporting plate one on each side of the shaft 56, each carry a feed belt 62 and 63, the belts each engaging one of the pulleys 58 and 59 on the shaft. The gear motor 57 and the pulleys 58 and 59 may be chosen to provide any desired belt speed which will, of course, be the speed at which workpieces are carried to the drum 30. For added versatility, a selectively adjustable gear box 64 may be interposed between the motor 57 and the shaft 56 so that the speed of workpiece transport may be regulated conveniently.

Over the drum 30 and beneath the idler pulley, 60, the upper platform 13 is formed with a slot 70 downwardly through which the workpieces are directed into the drum. One or more curved work guides 71 carried by the upper platform 13 or the elevated structure sustained by the standards 50, 51 may be employed overlying the upper platform to deflect the workpieces downwardly. An air nozzle 72 may be associated with the work guides 71 further to influence down turning of the workpieces.

When a workpiece falls by gravity through the slot 70, it is confined within a guide means which takes the form of a narrow compartment in the drum 30 between a fixed plate 75 depending from the upper platform 13 at one side of the slot 70 and a tamping plate 76 carried on guide rods 77 and the piston rod 78 of an air piston 79 supported on a bracket 80 depending into the drum at the opposite side of the slot 70.

The fixed plate 75 is formed with an opening 81 having a size and shape slightly smaller than the exterior dimensions of the workpiece being handled, so that the workpiece will not fall of its own weight through the aperture. The tamping plate 76, moreover, is preferably of size and shape slightly smaller than the opening 81 and aligned therewith.

Supported on the fixed plate 75 above the opening 81 and outside the workpiece receiving compartment, is an air piston 85, influencing a crosshead 86, which carries spaced spring fingers 87, depending contiguous to the fixed plate. In the unactuated position of the air piston 85, the spring fingers 87 depend into the opening 81 and serve to deter accidental retrograde movement of workpieces through the opening. When actuated, the air piston 85 elevates the spring fingers above the opening 81 so that the tamping plate 76 may urge the next succeeding workpiece through the opening 81.

A workpiece detecting switch 90 is carried on the fixed plate 75. As will be described in greater detail in the description of the operation of this stacking unit which follows hereinbelow, the switch 90 upon detection of each workpiece dropping into the compartment influences a cycle of operation of the air pistons 85, 79 and 38 which raise and lower the spring fingers 87, advance and return the tamping plate 76, and index the drum 30.

In those installations in which the operating unit 14 to which the stacker of this invention is appended delivers the workpieces with connection elements therebetween, as for instance, the chain of stitches 19 which extends between successive workpieces operated upon a sewing unit, this stacking device may include one or more thread chain cutting devices 101 each carried by an air cylinder 102 supported on the crosspiece 52.

Adjacent to the thread chain cutting device 101 is an air probe which comprises an air tube 103 directed from a source of compressed air and depending above the upper platform 13, and a flaired receiving tube 104 set into the upper platform 13 in alignment with the air tube 103. The flaired receiving tube 104 leads to a pressure detecting switch 105 which is thus operated in response to the passage of the gaps between successive workpieces which allow air to pass from the air tube 103 to the tube 104 for detection by the switch 105 to operate the air piston 102 of the thread chain cutting device.

As a safety interlock preventing continued operation of the stacker beyond the maximum capacity of the drum 30, a limit switch 110 may be provided on the upper platform 13 for operation by an abutment 111 on the drum, when the drum reaches a position of maximum capacity. The limit switch 110 may operate a signal lamp 112 on the upper platform and may in addition, serve to discontinue operation of the stacking unit and of the operating unit 14 as well.

Operation.

Referring to FIG. 2, which illustrates the electrical wiring for the controls of the stacking unit, and to FIG. 3 which illustrates the pneumatic connections for the air pistons and airtubes and nozzles, the operation of this stacking unit can be understood.

As indicated in FIG. 3, the air piston 38 for indexing the drum 30, air piston 39 for the friction clutch, air piston 85 for the spring fingers 87, and the air piston 102 for the thread chain cutter are preferably internally spring returned, whereas the air piston 79 for the tamping plate is a double acting unit. High pressure air which may be regulated to approximately 70 p.s.i., is directed from a manifold 120 to operate each of the air pistons, the double acting air piston 79 for the tamping plate being returned by an auxiliary air pressure supply 130 which is preferably regulated to approximately 30 p.s.i. The work guiding nozzle 72 and the air tube 103 of the air probe may be connected to the manifold 120.

Interconnecting the air piston 102 for the thread chain cutter with the manifold 120 is a three way valve 140 controlled by a solenoid W which when deenergized connects the air piston to the atmosphere and when energized interconnects the air piston with the manifold 120.

A similar three way valve 150 controlled by a solenoid U is interposed between the manifold 120 and the air piston 38 for indexing the drum and the air piston 85 for operating the spring fingers 87.

For operating the air piston 79 of the tamping plate 76 a similar three way valve 150 controlled by a solenoid V is interposed between one port of the air piston 79 and the manifold 120. The other port of the double acting air piston 79 is connected by way of an adjustable check valve 170 to the auxiliary manifold 130.

The air operated friction clutch 39 is connected to the manifold 120 by way of a three way valve 180 controlled by the manual operator element 40.

Referring to FIG. 2, which illustrates a preferred wiring diagram across the lines A and B, the gear motor 57 and the operating unit 14 are both connected across the lines in series with normally open contacts 20CR-1 and 20CR-2 of a control relay 20CR. The control relay 20CR is arranged in series across the line with the normally closed limit switch 110 which is opened when the drum reaches maximum capacity to deactivate the motor 57 and the operating unit 14. The limit switch 110 may be of a double pole variety and when opened, operate a lamp circuit for the signal lamp 112.

The pressure responsive switch 105, which is normally closed, is in series across the line with a control relay 6CR. The normally closed contact 6CR-1 and the normally open contact 6CR-2 are arranged as illustrated in FIG. 2 in a conventional charging circuit for a capacitor C-1 chargeable by way of a diode D-1 providing for momentary operation of solenoid W by discharge of the capacitor C-1 upon closure of the switch 105.

The switch 90 which is normally closed and senses the fall of workpieces into the drum is in series across the line with a control relay 12CR. The normally closed contact 12CR-1 and the normally open contact 12CR-2 are arranged as illustrated in FIG. 2 in a conventional charging circuit for a capacitor C-2 chargeable by way of a diode D-2 providing for momentary operation of solenoids U and V by discharge of the capacitor C-2 upon closure of the switch 90.

Having thus set forth the nature of this invention, what we claim herein is:

1. A device for stacking fabric workpieces comprising a cylindrical container for accommodating said workpieces radially therein in an annular array, guide means for directing workpieces in seriatim radially into said container including means providing for constraint of a workpiece in said guide means in substantially flat planar position parallel to the axis of said cylindrical container, a partition extending radially within said container substantially parallel to the axis of said cylindrical container, means shiftably supporting said partition for angular movement toward and away from one side of said guide means about an axis concentric with that of said container, and means responsive to the passage of each successive workpiece along said guide means into said container for transferring said each successive workpiece from said guide means toward said partition.

2. A device for stacking workpieces comprising a cylindrical drum for accommodating said workpieces radially therein in an annular array, a workpiece retaining element extending into said cylindrical drum, means for reciprocating said workpiece retaining element axially of said drum, a partition extending radially within said drum, means shiftably supporting said partition for angular movement toward and away from one side of said workpiece retaining element about an axis concentric with that of said cylindrical drum, guide means for directing workpieces in seriatim radially into said drum at the side of said workpiece retaining element opposite that toward which said partition is shiftable, a workpiece tamping member carried in said drum, means for reciprocating said tamping member transversely across said guide means toward and away from the position of said workpiece retaining element, means responsive to the passage of each successive workpiece along said guide means into said drum for effecting, in seriatim, operation of said means for reciprocating said tamping member and operation of said means for reciprocating said workpiece retaining element.

3. A device for stacking workpieces comprising a cylindrical drum for accommodating said workpieces radially therein in an annular array, a workpiece retaining element extending into said cylindrical drum, means for reciprocating said workpiece retaining element axially of said drum, a partition extending radially within said drum, means shiftably supporting said partition for angular movement toward and away from one side of said workpiece retaining element about an axis concentric with that of said cylindrical drum, indexing means effective to shift said partition away from said workpiece retaining element in increments equivalent to the thickness of one of said workpieces being stacked, guide means for directing workpieces in seriatim radially into said drum at the side of said workpiece retaining element opposite that toward which said partition is shiftable, workpiece tamping member carried in said drum, means for reciprocating said tamping member transversely across said guide means toward and away from the position of said workpiece retaining element, means responsive to the passage of each successive workpiece along said guide means into said drum for effecting operation of said partition indexing

means and in seriatim effecting operation of said means for reciprocating said tamping member and operation of said means for reciprocating said workpiece retaining element.

4. A device for stacking workpieces comprising a cylindrical drum arranged on a vertical axis for accommodating said workpieces radially therein in an annular array, a workpiece retaining element extending vertically into said cylindrical drum, means for reciprocating said workpiece retaining element axially of said drum, a vertical partition extending radially within said drum, means shiftably supporting said partition for angular movement toward and away from one side of said workpiece retaining element about an axis concentric with that of said cylindrical drum, guide means for directing workpieces in seriatim downwardly into said drum into a vertical position radially of said drum and at the side of said workpiece retaining element opposite that toward which said partition is shiftable, a workpiece tamping member carried in said drum, means for reciprocating said tamping member horizontally across said guide means toward and away from the position of said workpiece retaining element, means responsive to the passage of each successive workpiece along said guide means into said drum for effecting, in seriatim, operation of said means for reciprocating said tamping member and operation of said means for reciprocating said workpiece retaining member.

5. A device for stacking workpieces which differ in thickness one end relatively to the other, comprising a cylindrical drum for accommodating said workpieces in edgewise position radially within said drum in an annular array, guide means for directing workpieces in seriatim into said drum, said guide means including a plate extending radially within said drum and formed in said drum with an aperture having substantially the size and shape of a workpiece to be stacked, a radial partition carried in said drum, means supporting said drum for turning movement to shift said partition toward and away from said guide means plate, a retractable workpiece retaining element, means shiftably supporting said retaining element for movement into and out of a position blocking the aperture of said guide means plate, a workpiece tamping member carried in said drum, means for reciprocating said tamping means through the aperture in said guide means plate, and means responsive to the passage of each successive workpiece along said guide means into said drum for effecting, in seriatim, operation of said means for reciprocating said tamping member, operation of said means for shifting said workpiece retaining element out of and into position blocking the apertured said guide means plate, and operation of said means for turning said drum to shift said partition away from said guide means plate.

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