

Feb. 3, 1942.

H. C. KELLER ET AL

2,272,009

APPARATUS FOR COMPACTING FOLDED GOODS

Filed Jan. 19, 1939

3 Sheets-Sheet 1

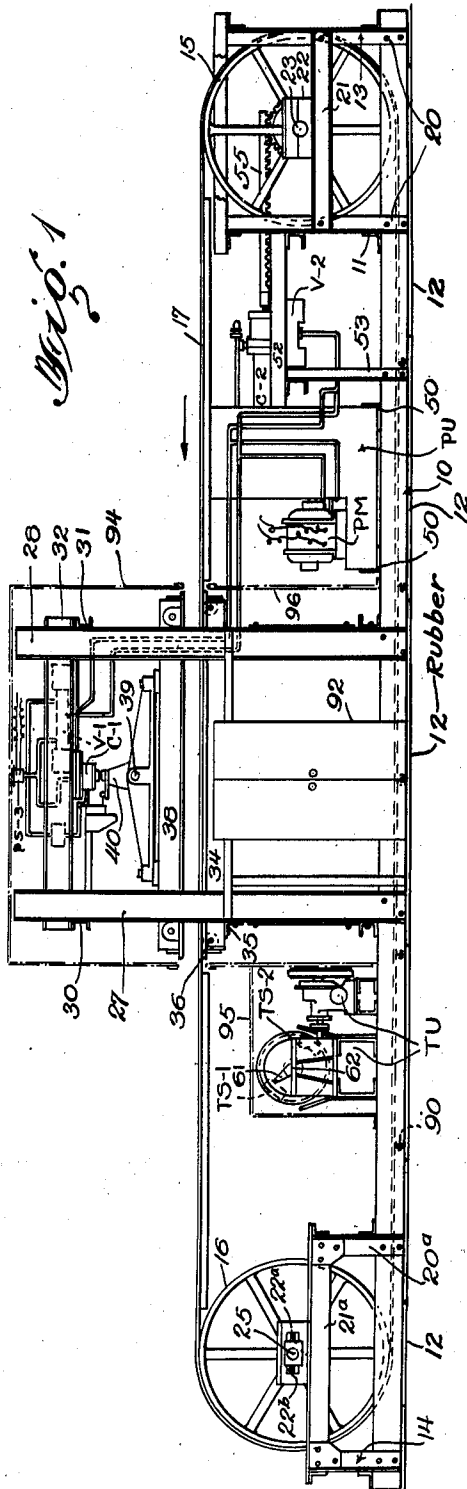
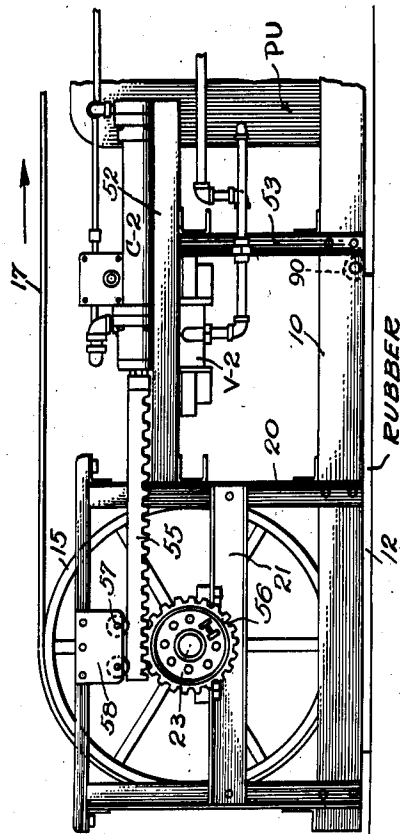


Fig. 2



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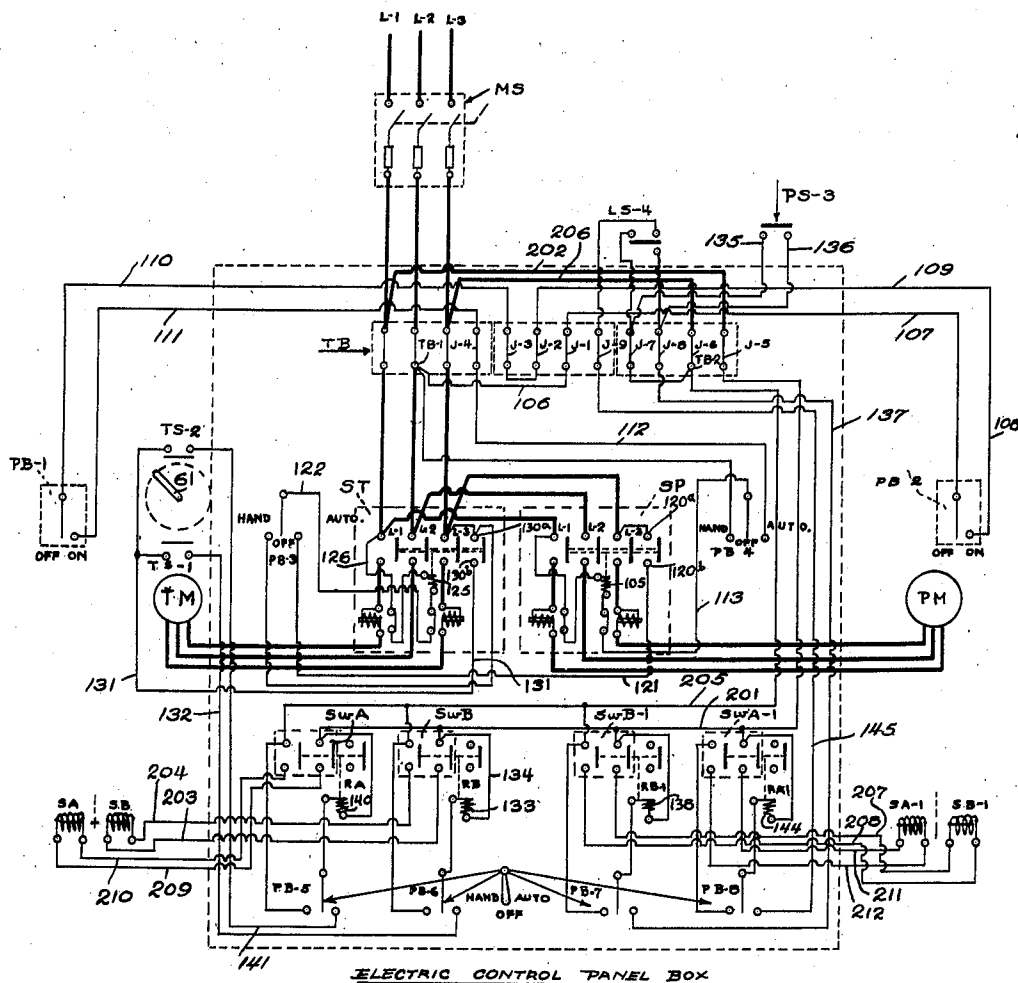
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3 Sheets-Sheet 3



WIRING DIAGRAM

Fig. 5

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2,272,009

APPARATUS FOR COMPACTING FOLDED GOODS

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Application January 19, 1939, Serial No. 251,864

9 Claims. (Cl. 38—10)

This invention relates to apparatus for compacting folded goods, such as lace curtains, sheets, pillow-cases, towels, and like articles.

Heretofore it has been customary practice, in preparing such articles for shipment, to compact the articles following the operation by which they are folded, for the purpose of reducing their bulk and to improve their sales appearance. In the case of lace curtains, referred to by way of example, the curtains were first folded by a hand operation and thereafter a vertical stack of about twelve or fifteen curtains was placed in a pallet-type press having heating elements top and bottom. The press was then closed for several seconds and thereafter opened and the stack of curtains removed. Thereupon the stack was broken down into three or four plies and the piles shuffled so that the curtains which were in the middle of the first-formed stack thereupon assumed a placement at the top or bottom of the second-formed stack which was thereupon placed in the press and subjected to a second compacting operation. These operations of rearranging and restacking the folded articles of the stack following a partial compacting operation were repeated as many times as necessary to give each folded curtain a fairly even compacting action, with the result that the bulk or thickness of a folded curtain was reduced about one-half, and the appearance thereof from the sales standpoint was improved.

The present invention contemplates novel apparatus for compacting goods which are sold in folded form, such as textile goods generally, by which substantial saving in time and effort is effected and by which the compacting operation can be more expeditiously carried on than heretofore.

In its more specific aspects, the present invention provides novel and highly efficient apparatus which operates automatically and in predetermined cyclical manner to effect in a single operation the simultaneous compacting of a plurality of folded articles arranged in edge to edge relation on an intermittently moving horizontal supporting surface, thus to speed up production and also to eliminate the manual manipulation and excessive handling of the articles which characterized prior practice. In such apparatus a novel control system is employed by which proper cyclical operation of the apparatus, as well as its continuous operation throughout successive cycles, is assured, and which at the same time satisfies safety requirements.

Other objects will be in part obvious and in

part hereinafter pointed out in connection with the following analysis of this invention wherein is illustrated an embodiment of the invention in detail.

5 In the drawings—

Fig. 1 is a side elevation of compacting apparatus in accordance with the present invention;

Fig. 2 is a detail of the belt drive mechanism;

10 Fig. 3 is a diagram of the hydraulic piping system;

Fig. 4 is a diagram of an 8-second cycle of operation of the apparatus of the present invention; and

15 Fig. 5 is a diagram of the electrical control system.

Referring to the drawings wherein like reference characters indicate like parts throughout the several views, reference character 10 indicates an elongated bed frame which may be constituted by two longitudinal channels secured in spaced relation by transverse beams 11. Preferably the bed frame is insulated from the floor or support on which it is laid by rubber cushions 12.

25 At each end of the bed frame are provided end frames generally indicated at 13, 14, which provide a mounting for carrier drums 15, 16 over which extends a carrier 17 which preferably takes the form of a stainless steel belt of endless construction. The end frames 13, 14 are each preferably constituted by uprights 20, 20a, respectively, which are secured as by welding or riveting to the bed frame, the uprights of each side frame being connected at their upper ends 30 by horizontal sills or rails 21, 21a. To the rails are secured journal boxes 22, 22a for bearings in which drum shafts 23, 25, respectively, are adapted to rotate about horizontal axes which extend transversely of the bed frame and adjacent the ends thereof. As will be described hereinafter, the drum 15 constitutes the driving drum for the belt 17, tension of which may be adjusted by the take-up mechanism 22b of known construction, which permits limited shifting of the axis about 45 which shaft 25 rotates.

Intermediate the ends of the bed frame is arranged a platen supporting frame formed as by upright channels 27, 28 which extend upwardly at each side of the bed frame and have their lower ends secured thereto. The upper ends of the channels 27, 28 are connected by transverse beams 30, 31 which extend from side frame to side frame and which in turn support the longitudinally arranged intermediate beam 32.

55 Secured between the side frames as described

is a bottom platen 34, such being supported on transverse beams 35 extending between the side frames. The lower platen 34 is stationary and is so positioned vertically that the upper flight or run of the carrier belt 17 is supported thereon as the belt is advanced during its travel. At the ends of the platen are provided supporting rolls 36 on which the belt bears as it moves over platen 34.

Also arranged between the side frames is a top platen 38 which is pivoted as at 39 to a head 40 secured to a piston (shown in dotted lines, Fig. 3) operating in a hydraulic cylinder C—1 carried by the intermediate beam 32.

The top platen 38 is movable and is adapted to be operated by pressure fluid supplied to cylinder C—1 by a hydraulic pump unit, generally designated PU, which includes a hydraulic pump of conventional construction powered by an electric motor PM, the unit being supported on spaced beams 50 which extend transversely of the longitudinal bed frame beams 10, the positioning of the pump unit being preferably in advance of the platen support and intermediate the upper and lower flights of belt 17. As will be hereinafter described in detail, the pump unit is connected to deliver pressure fluid alternately to the ends of the cylinder C—1 thereby to actuate the platen 38.

Arranged between the pump unit PU and the righthand belt drum 15 is a hydraulic cylinder C—2 which may be supported on a longitudinal supporting member 52 secured at one end to an upright 53 extending from the bed frame and at its other end to the upright 29 of the adjacent drum supporting end-frame. Arranged in the cylinder is a piston (as shown in dotted lines, Fig. 3) to the operating rod of which is connected a rack 55 which extends towards the supply end of the apparatus. As will be seen from Fig. 2, such being a partial elevation of the supply end of the apparatus from the rear thereof, the rack has its toothed under-surface engaging with a gear 56 arranged on the shaft 23 of drum 15. The upper face of the rack engages against guide rollers 57 carried by a guide block 58 depending from an auxiliary framework associated with the rear end frame 29 (Fig. 1). Gear 56 is related to the shaft 23 by a free-wheeling clutch mechanism 59 of known construction arranged to be disengaged as gear 56 rotates in anti-clockwise direction (Fig. 2) but which automatically engages to couple the gear 56 and shaft 23 whereby to drive the latter and hence drum 15 as the gear is rotated in clockwise direction by movement of the rack to the right (or to the left in Fig. 1).

As will be described, the pump unit PU is adapted to supply pressure fluid to the left end of cylinder C—2 (Fig. 1), thus to actuate rack 55 to the right, during which movement drum 15 idles and the belt 17 is stationary; and to the right end of cylinder C—2 thereby to effect movement of rack 55 to the left, during which movement the clutch 59 engages to complete the driving connection between the rack and the shaft 23 of the belt drum 15, thereby to advance the upper flight of the belt 17 to the left.

Arranged between the platen frame and the driven belt drum 16 is a timing unit of standard construction, generally designated TU, the unit including a motor TM for driving a rotating timing arm 61 about a transverse axis 62. During rotation of the timing arm 61 it engages timing switches TS—1 and TS—2, respectively, said

switches being arranged in electric circuits to be described which control actuation of a valve assembly in the fluid line between the pump unit PU and the cylinder C—1.

Referring to Fig. 3, the valve assembly under the control of the timing switches is designated V—1, being positioned preferably above the upper platen 38 and carried by the intermediate beam 32 of the platen frame. This valve assembly is of known construction, being of the solenoid-actuated, four-way type providing a valve casing 65 in which the valve element operates, and end casings thereon, of which the left-end casing encloses a solenoid coil SA and the right-end casing encloses a solenoid coil SB. A fluid line 66, 66a extends from the pump unit PU to the valve casing 65, and from the valve casing there extends a fluid line 67 to the upper end of cylinder C—1 and a second fluid line 68 to the lower end of cylinder C—1. A return line 69 from the valve casing extends back to the pump unit PU whereby either end of the cylinder C—1 may exhaust to the pump unit.

Arranged in the line 67 is a pressure switch PS—3 connected in a control circuit to be described, the setting of which is such that the switch incorporated therein is open upon the occurrence of normal or sub-normal pressures in line 67 but closes in response to an increase of pressure in the line, such as would result upon the piston of cylinder C—1 arriving at the lower end of its stroke, with consequent building up of pressure in the upper end of the cylinder and in line 67.

Also carried by the platen framework is a limit switch LS—4 connected in a control circuit to be described, the switch having an arm 70 which is engaged by the top platen head 40 when the top platen is in raised position. Switch LS—4 is normally open, but is closed upon platen head 40 engaging the arm 70.

The pressure switch PS—3 and the limit switch LS—4 are arranged in electrical circuits adapted to control actuation of a valve assembly V—2 connected in a pressure fluid circuit between the pump unit PU and the cylinder C—2. This valve assembly V—2, like the valve assembly V—1, is of the solenoid-actuated, four-way type, and includes a valve casing 72 carrying at its ends casings adapted to enclose solenoids SA—1 and SB—1, respectively. Pressure fluid from the pump unit is supplied to the valve assembly V—2 through line 66b, fluid line 73 connecting the valve and the left end of cylinder C—2, and fluid line 74 connecting the valve and the right end of cylinder C—2. The exhaust from the cylinder is returned to the pump unit through the return line 75. Arranged in line 74 is a flow-control unit 76 of conventional construction designed to control the rate of supply of fluid to the right end of cylinder C—2 whereby the rate of movement of rack 55 to the left may be controlled as desired.

Drain lines 77 and 78 extend, respectively, from the pressure switch PS—3 and the flow-control unit 76 back to the pump unit PU.

With the above general description in mind, the contemplated arrangement is such that closing of the timer-actuated switch TS—1 is adapted to energize solenoid SB which in turn actuates the valve of the assembly V—1 in proper direction to supply pressure fluid from line 66 to the line 67 and hence to the upper end of cylinder C—1. Closing of timer-actuated switch TS—2 results in energization of solenoid SA and

actuation of the valve of the valve assembly V—1 in proper direction as to supply pressure fluid from line 66 through line 68 to the lower end of cylinder C—2, the upper end exhausting through valve V—1 back to the pump unit through lines 67 and 69. Closing of pressure switch PS—3 results in energization of solenoid SB—1 which actuates the valve of the valve assembly V—2 in proper direction to admit pressure fluid from line 66, 66b through the valve and line 73 to the left end of cylinder C—2 to actuate rack 55 on its idling stroke. Closing of switch LS—4 results in energization of solenoid SA—1 to actuate the valve of the assembly V—2 in proper direction as to admit pressure fluid from the line 66, 66b through the valve and line 74 to the right end of cylinder C—2, thereby to actuate rack 55 to the left on its working or belt driving stroke.

It will be here noted that each of the valve elements incorporated in the assemblies V—1 and V—2 maintains the position to which it has been actuated until positively actuated out of that position by the opposing solenoid. Thus, if solenoid SA has moved the valve of the assembly V—1 to a required position, the valve remains in that position until the opposing solenoid SB is energized, even though deenergization of solenoid SA occurs prior to the energization of solenoid SB.

The cycle of operation of the apparatus as described as well as its timing sequence will be seen from an analysis of Fig. 4, such constituting a diagram of 8-second cycle of operation. In this diagram the upper half represents the sequence of operation and the timing between operations of the top platen as determined by pressure conditions in cylinder C—1, the lower half of the diagram representing the sequence of operation and timing of the driving gear associated with belt drum 15 as controlled by pressure conditions in cylinder C—2.

Assuming that the cycle commences with the top platen 38 in raised position, and with timer arm 61 about to close switch TS—1, it will be understood that the switch PS—3 is open and switch LS—4 closed, the latter resulting from the completion of the preceding cycle. As the new cycle is initiated, switch TS—1 closes, solenoid SB is energized, and pressure fluid is admitted to the upper end of cylinder C—1 to lower the platen 38, this lowering movement, in the cycle under description, being completed in a half second interval. At the start of the cycle, piston of cylinder C—2 is in its lefthand position, following energization of solenoid SA—1 in the previous cycle. During the half-second required for the lowering movement of platen 38, the drive gear is idle and the belt is stationary. However, as platen 38 reaches its lowermost position, pressure builds up in cylinder C—1 and closes pressure switch PS—3. Solenoid SB—1 is thereupon energized and pressure fluid is admitted to the left end of cylinder C—2, whereupon rack 55 moves to the right on its idling stroke, the belt remaining stationary.

The rate of movement of the timing arm 61 for the cycle under description is such that an interval of two and one-half seconds transpires between successive engagements with switches TS—1 and TS—2. This interval represents the half-second period required for lowering the platen 38 and a two-second compacting period during which the platen remains in its lowermost position to effect the compacting operation. In order that movement of the rack 55 to the right

is completed prior to closing of switch TS—2, pressure fluid is supplied to the left end of cylinder C—2 at a rate such that full movement of the rack to the right is effected in one and one-half seconds so that the rack may idle for the last half-second of the compacting period.

Upon completion of the two and one-half second interval aforesaid, timer arm 61 strikes switch TS—2, resulting in energization of solenoid SA and admission of pressure fluid to the lower end of cylinder C—1, the top platen then moving on its up stroke, which requires a half-second for its completion.

As pressure is released in the upper portion of cylinder C—1, switch PS—3 is opened and, as the platen reaches its raised position, switch LS—4 closes. During the last half-second of the compacting period and the half-second required for the up stroke of the platen, cylinder C—2 is inactive as solenoid SA—1 is deenergized but upon the upper platen closing switch LS—4 the solenoid SA—1 is energized and pressure fluid supplied to the righthand end of cylinder C—2, causing movement of the rack to the left and rotation of the drum 15 whereby to advance the belt. The arrangement is such that the belt moves forward approximately six feet upon every driving stroke of rack 55. While the timing is such that the platen 38 is maintained in its raised position for the following five seconds, the termination of which constitutes the end of the particular 8-second cycle, proper setting of the flow-control unit 75 permits completion of the working stroke of rack 55 in four and a half seconds, and during the final half-second of the cycle the rack idles, with the belt maintained stationary in its relatively advanced position.

In addition to the electric control as above described, a manual control is provided by push button switches PB—1 and PB—2, these switches being positioned adjacent the article supply end of the belt and at the removal end thereof. The control arrangement to be described is such that both switches PB—1 and PB—2 must be closed by the operators before the apparatus can function, and the addition of this type of control further provides readily accessible means at the command of either operator to stop the operation of the apparatus upon the occurrence of trouble, or danger to the operator.

Considering now the wiring diagram of Fig. 5 which illustrates the various control circuits referred to in the foregoing description, a main switch MS introduces the three-phase 60-cycle 440 volt line to the terminal block TB, which is mounted in an electric control panel box, through the intermediary of fuses in well known manner. The three-phase mains L—1, L—2 and L—3 are carried through the terminal block TB by way of jumpers to corresponding contacts both of a switching mechanism ST for operating the timer motor TM and of a switching mechanism SP for operating the motor PM of the pump unit.

With the switches PB—3 through PB—8 inclusive (to be referred to hereinafter) set for automatic operation, a control circuit for energizing the actuating coil 105 of switch SP, and hence the actuating coil 125 of switch ST, is completed upon the closing of both operator-controlled switches PB—1 and PB—2.

This circuit may be traced from terminal TB—1, conductor 106, jumper J—1, conductor 107, switch PB—2, conductors 108, 109, jumpers J—2, J—3, conductor 110, switch PB—1, conduc-

tor 111, jumper J—4, conductor 112, switch PB—4, conductor 113, operating coil 105, and to the line side contact L—1 of the switch SP. The energization of coil 105 effects the closing of the multiple contacts of the switch SP by actuating a contactor which bridges the three line and motor contacts of switch SP.

Actuation of the contactor as aforesaid also bridges an additional set of contacts 120a, 120b, which completes a circuit through line side contact L—3 of switch SP, conductor 121, switch PB—3, conductor 122, operating coil 125 of the switch ST, conductor 126, to the line-side contact L—1 of the switch ST. The energization of the coil 125 operates the contactor of switch ST to complete the circuit to the timer motor TM.

The operation of the pump motor develops the necessary fluid pressure for supplying fluid under pressure to the cylinders C—1, C—2 as required according to the cycle of operations as above described, upon proper manipulation of the valves of the assemblies V—1, V—2 by the switches TS—1, TS—2, PS—3, LS—4.

Again assuming the cycle to be initiated when the top platen 38 is at its upper limit of movement, at which time switch LS—4 is closed following completion of the last preceding cycle, the timer arm engages switch TS—1 to complete the following circuit: Line side contact L—3 of the switch ST, additional set of contacts 130a, 130b thereof, conductor 131, switch TS—1, conductor 132, switch PB—6, operating coil 133 of relay RB, conductor 134, and conductor 201 connected to line L—1 through jumper J—5 and conductor 202. The operating coil 133 when energized as above actuates a contactor which bridges the contacts of the switch mechanism SwB, and completes the circuit for the solenoid SB as follows: Main L—1, conductor 202, jumper J—5, conductor 201, switch SwB, conductor 203, solenoid SB, conductor 204, the switch SwB, conductor 205, jumper J—6, and conductor 206 back to main L—3. Energizing of solenoid SB actuates the valve of assembly V—1 to supply pressure fluid to the upper end of cylinder C—1, thereby to lower the top platen 38. As the platen commences its lowering movement, it moves away from switch LS—4 causing it to open.

Upon the platen reaching its down position, switch PS—3 closes and energizes solenoid SB—1, to cause pressure fluid to be supplied to the left end of cylinder C—2, through the following circuit: Main L—3, conductor 206, jumper J—6, terminal TB—2 of the terminal block, jumper J—7, conductor 135, switch PS—3, conductor 136, jumper J—8, conductor 137, switch PB—7, coil 138 of relay RB—1, and conductor 201 back to main L—1 through jumper J—5 and conductor 202. The energization of coil 138 of relay RB—1 actuates a contactor which bridges the contacts of switch SwB—1, thus to connect the coil SB—1 across the supply conductors 201, 205, through conductors 207, 208. The energization of the solenoid SB—1 so actuates the valve assembly V—2 for cylinder C—2 that pressure fluid is admitted to the left end of the cylinder to actuate rack 55 to the right on its idling stroke in preparation for its driving stroke.

Following the completion of the movement of rack 55 to the right, timer arm 61 engages switch TS—2 to close the same and to complete a circuit through solenoid SA, thereby to effect raising of the platen 38. This circuit may

be traced as follows: Main L—1, conductors 202, 201, operating coil 140 of relay RA, switch PB—5, conductor 141, switch TS—2, and conductor 131 connected to main L—3 as aforesaid. Relay coil 140 when energized causes actuation of contactor of the switch SwA to bridge the contacts thereof, thereby to complete the circuit of solenoid SA across supply conductors 201, 205 through conductors 209, 210. Energization of solenoid SA so operates the valve assembly V—1 that pressure fluid is admitted to the lower end of the cylinder C—1, thus to actuate the top platen to its raised position.

Pressure switch PS—3 is opened upon the initiation of the upward movement of the platen and, upon the platen reaching its raised position, switch LS—4 closes and completes the circuit of solenoid SA—1 thereby to admit pressure fluid to the right end of cylinder C—2 for the return or working stroke of the rack 55. This circuit may be traced from conductor 201 connected with line L—1, energizing coil 144 of relay RA—1, switch PB—8, conductor 145, jumper J—9, switch LS—4, jumper J—7, terminal TB—2, and back to main L—3 through conductor 206. Coil 144 when energized operates the contactor of switch SwA—1 to bridge the contacts thereof, thus to complete the circuit of solenoid SA—1 across supply conductors 201, 205 through the conductors 211, 212. Energization of solenoid SA—1, as hereinbefore noted, results in actuation of the valve of assembly V—2 whereby to admit pressure fluid to the right end of the cylinder C—2 and hence movement of rack 55 to the left on its driving stroke.

As the switches PB—1 and PB—2 on the opposite ends of the machine are inserted in series in the circuit containing the solenoid 105 which operates the switching device SP, the closing of which is essential to the starting of the complete apparatus, it will readily be appreciated that the arrangement is such that both operating switches PB—1 and PB—2 must be closed by the operators at the ends of machine before the machine can operate.

Again, as switch LS—4 is closed only when the top platen is in fully raised position, with switch PS—3 being closed only when the top platen is in fully lowered position, it will be seen that the respective switches serve as an interlock between the platen and belt drive controls, the arrangement being such as to prevent both cylinders C—1 and C—2 from operating at the same time. Such an interlock provides for travel of the top platen only during periods when the belt drive is stationary, and for movement of the belt drive either on its idling or its working stroke only during periods when the platen is stationary.

In the analysis of the circuits outlined above, the switches PB—3—PB—8, inclusive, were assumed to be in position for automatic operation and the circuits were so traced. These switches have another position in addition to their "automatic" and "off" positions, such being designated as an "hand" position this for the purpose of enabling each one of the units controlled by the switches, as well as the switches themselves, to be tested for mechanical or electrical trouble. It is readily seen that the throwing of the respective switches to the "hand" position connects the operating coil of the several contactors across two of the mains of the three-phase line.

The switches SP and ST for the pump motor and the timer motor, respectively, are in addi-

tion provided with overload protective devices which serve to break the operating circuits for the contactors upon any trouble developing in the system.

By reference to Figs. 1 and 3, taken in conjunction with the foregoing description, the apparatus of the present invention is laid out and organized for compactness and working accessibility. Thus major units of the apparatus, such as the pump unit, the timing assembly, and the belt drive cylinder and its valve assembly are arranged in the space between the upper and lower runs of the belt 17, this placement being such, however, as not to interfere with the movement of the belt, the upper run of which operates at a level above said units, and the lower run of the belt being arranged to travel in the space below the units and above the supporting floor on which the bed frame is set up. Preferably the lower belt run is supported on rollers 90 extending between the spaced channels of the bed frame. It will be further appreciated that large areas of the belt are provided on both sides of the operating platens, thus to give ample space for the operators and adequate supporting surface for a large number of the articles being operated on. The electric control panel box, designated 92, is preferably arranged at the front of the apparatus and between the front channels 27, 28 of the platen supporting frame, whereby the electrical control equipment is readily accessible for test and repair purposes.

As a safety measure, the upper portion of the platen frame in which the top platen operates may be enclosed by a housing 94, thereby minimizing the likelihood of injury to the operators. Similarly, the timing unit may be enclosed in a housing 95, and if desired the pump unit may be similarly enclosed as by housing 96.

In the practice of the invention, and with apparatus operating as aforesaid, the operator stationed at the front or supply end of the apparatus (the right end in Figs. 1 and 3) lays a plurality of curtains or like articles on the belt during a period that the belt is stationary, the curtains being supplied to the operator from a tying machine (not shown). With each folded curtain or pairs or groups thereof requiring about one foot of belt length, the supply end of the belt which extends approximately 8 feet in length will accordingly take about eight curtains or pairs or groups thereof, such being laid in edge to edge relation. As the belt is stationary for a period of three and a half seconds during each cycle as above explained, an operator working at a steady pace can maintain the supply end of the belt loaded, or substantially so.

Upon the belt being advanced, the loaded portion thereof is advanced to a position between the compacting platens 34, 38, the top platen 38 being in raised position. Upon the advance movement of the belt being interrupted, the top platen is lowered to its compacting position, in which it exerts substantial pressure on the articles carried by the belt, the latter being supported by the bottom platen 34. The top platen 38 may be steam-heated in conventional manner and, when so heated (not shown), the heating and pressure action is such that even compacting and the desired reduction in bulk of the articles results. Upon completion of the compacting period, the top platen is actuated to its raised position. During the periods of lowering and raising of the top platen and the intermediate compacting period, the operator at the supply

end continues to load articles on the fresh belt surface presented to him by the advance movement of the belt as aforesaid.

Upon the top platen returning to its raised position, the belt is given a further advance movement, and the compacted articles on the first-loaded belt portion are advanced to a removal station where a second operator is positioned. Movement of the belt is interrupted, with the second operator being given a period of three and a half seconds according to the cycle under description to remove the compacted articles from the belt.

During the latter period when the belt is stationary, the top platen is lowered to effect the compacting of the second-laid batch of articles, with the operator at the supply end continuing his loading of articles on the fresh surface of the belt presented to him. These operations are continued so long as the apparatus operates throughout its cycle of operation as described.

It will be here noted that the action of cylinder C-1 is such that inequalities in the thickness of the articles being compacted will be compensated for in automatic manner. Thus if the material of the articles is relatively thick or heavy, the platen does not descend quite the same amount as if the material is thin, and the hydraulic cylinder acts in much the same manner as a spring connection between the top platen and head 40 would act in compensating for inequalities in the work.

While in the foregoing description an 8-second cycle of operation, i. e. $7\frac{1}{2}$ cycles per minute, has been described, it will be understood that the length of the cycle, and hence the number of cycles per minute, may be varied within limits by proper adjustment of the timing unit TU which controls the frequency of the operating cycle. Thus, by varying the rate of angular movement of the timing arm 61, the duration and hence the frequency of the cycle may be varied.

As many changes could be made in carrying out the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

We claim:

1. In automatic compacting apparatus of the character described, the combination of a stationary platen, a movable platen, fluid-operated means for actuating the movable platen throughout its cycle of movement from a retracted to a compacting position, and thence to its retracted position, timing means for controlling the actuation of said means and for establishing the periods of movement and of rest of the movable platen, a carrier movable in a path which extends between the platens, means movable throughout idling and working strokes for actuating said carrier, means responsive for its actuation to full movement of the movable platen to its compacting position for effecting operation of the carrier actuating means throughout its idling stroke, and means responsive for its actuation to full return movement of the movable platen to its retracted position for rendering the carrier actuating means operable throughout its working stroke.

2. In an automatic compacting apparatus of the character described, the combination of a stationary platen, a movable platen, fluid-operated means for actuating the movable platen

throughout its cycle of movement from a retracted to a compacting position and thence to its retracted position, timing means for controlling the actuation of said means and for establishing the periods of movement and of rest of the movable platen, a carrier movable in a path which extends between the platens, means movable throughout idling and working strokes for actuating said carrier, means actuable by the movable platen in its retracted position for effecting operation of the carrier actuating means through its idling stroke, and means actuable by the movable platen in its retracted position for effecting operation of the carrier actuating means throughout its working stroke.

3. In an automatic compacting apparatus of the character described, the combination of a stationary platen, a movable platen, fluid-operated means for actuating the movable platen throughout its cycle of movement from a retracted to a compacting position and thence to its retracted position, timing means for controlling the actuation of said means and for establishing the periods of movement and of rest of the movable platen, an endless carrier having a run extending between said platens, fluid-operated means movable throughout idling and working strokes for intermittently actuating the carrier whereby to advance successive portions of said run to the platens, and mechanism for controlling actuation of said last fluid-operated means including means responsive for its actuation to full movement of the movable platen to its compacting position and means responsive for its actuation to full return movement of the movable platen to its retracted position.

4. In automatic compacting apparatus of the character described, the combination of operatively related stationary and movable platens, a fluid-pressure cylinder for actuating the movable platen throughout its cycle of movement, an endless carrier having a run extending between said platens, a second fluid-pressure cylinder, driving connections between the second cylinder and the carrier, a source of pressure fluid, connections between the source and the ends of each said cylinders, and mechanism for alternately admitting pressure fluid from the source to said cylinders including a first valve means in the connections between the source and the first cylinder, a second valve means in the connections between the source and the second cylinder, timing means for controlling actuation of the first valve means, and means responding to the position of the movable platen for controlling actuation of the second valve means.

5. In automatic compacting apparatus of the character described, the combination of operatively related stationary and movable platens, a fluid-pressure cylinder for actuating the movable platen, an endless carrier having a run extending between said platens, a second fluid-pressure cylinder, driving connections between the second cylinder and the carrier, a source of pressure fluid, connections between the source and each end of the cylinders, timing mechanism for controlling the admission of pressure fluid alternately to the ends of the first cylinder whereby to actuate the movable platen throughout its cycle of movement from its retracted position to a compacting position and thereafter to return the movable platen to its retracted position, and means responsive to the movement of the movable platen to its compacting position and return

to its retracted position for controlling the admission of pressure fluid alternately to the ends of the second cylinder.

6. In automatic compacting apparatus of the character described, the combination of operatively related stationary and movable platens, a fluid-pressure cylinder for actuating the movable carrier, a source of pressure fluid, connections between said source and each end of the cylinder, valve means adapted to establish communication between the source and an end of the cylinder, timing mechanism for controlling actuation of the valve means thereby to cause actuation of the movable platen throughout its cycle of operation from a retracted position to a compacting position and thereafter to return the platen to its retracted position, an endless carrier having a run extending between said platens, a second fluid-pressure cylinder, driving connections between the second cylinder and the endless belt, fluid connections between the source and the second cylinder, valve means adapted to establish communication between the source and one end of the second cylinder, and means responsive to movement of the movable platen to compacting position and for return of the platen to its retracted position for controlling the actuation of the second valve means thereby to supply pressure fluid alternately to the ends of the second cylinder.

7. In automatic compacting apparatus of the character described, the combination of a stationary platen, a movable platen, fluid-operated means for actuating the movable platen throughout its cycle of movement from a retracted position to a compacting position and thereafter to return the movable platen to its retracted position, an endless carrier having a run extending between said platens, fluid-operated means for actuating said carrier whereby to advance successive portions of the run to the platens, a source of pressure fluid common to both said means, and electrical control means for determining the period and direction of movement of the movable platen within each cycle and providing for operation of the carrier actuating means only during the period that the movable platen is at rest in its retracted position.

8. In automatic compacting apparatus of the character described, the combination of a stationary platen, a movable platen, means for actuating the movable platen throughout its cycle of movement from a retracted position to a compacting position and thereafter to return the movable platen to its retracted position, an endless carrier having a run extending between said platens, means for actuating said carrier whereby to advance successive portions of the run to the platens, and electrical control means for causing alternate operation of said actuating means, said control means including switches each adapted to initiate movement of the movable platen in one direction, means operable to close said switches alternately and at predetermined time intervals, and platen controlled switches adapted to initiate operation of the carrier actuating means, said switches being closed alternately upon movement of the movable platen to its compacting and retracted positions.

9. In automatic compacting apparatus of the character described, the combination of a stationary platen, a movable platen, fluid-operated means for actuating the movable platen throughout its cycle of movement from a retracted position to a compacting position and thereafter to

return the movable platen to its retracted position, an endless carrier having a run extending between said platens, fluid-operated means for actuating said carrier whereby to advance successive portions of the run to the platens, a source of pressure fluid common to both said means, electrical control means for determining the period and direction of movement of the movable platen within each cycle and providing for opera-

tion of the carrier actuating means only during the period that the movable platen is at rest in its retracted position, and a plurality of operator-controlled means for rendering operative said electrical control means.

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