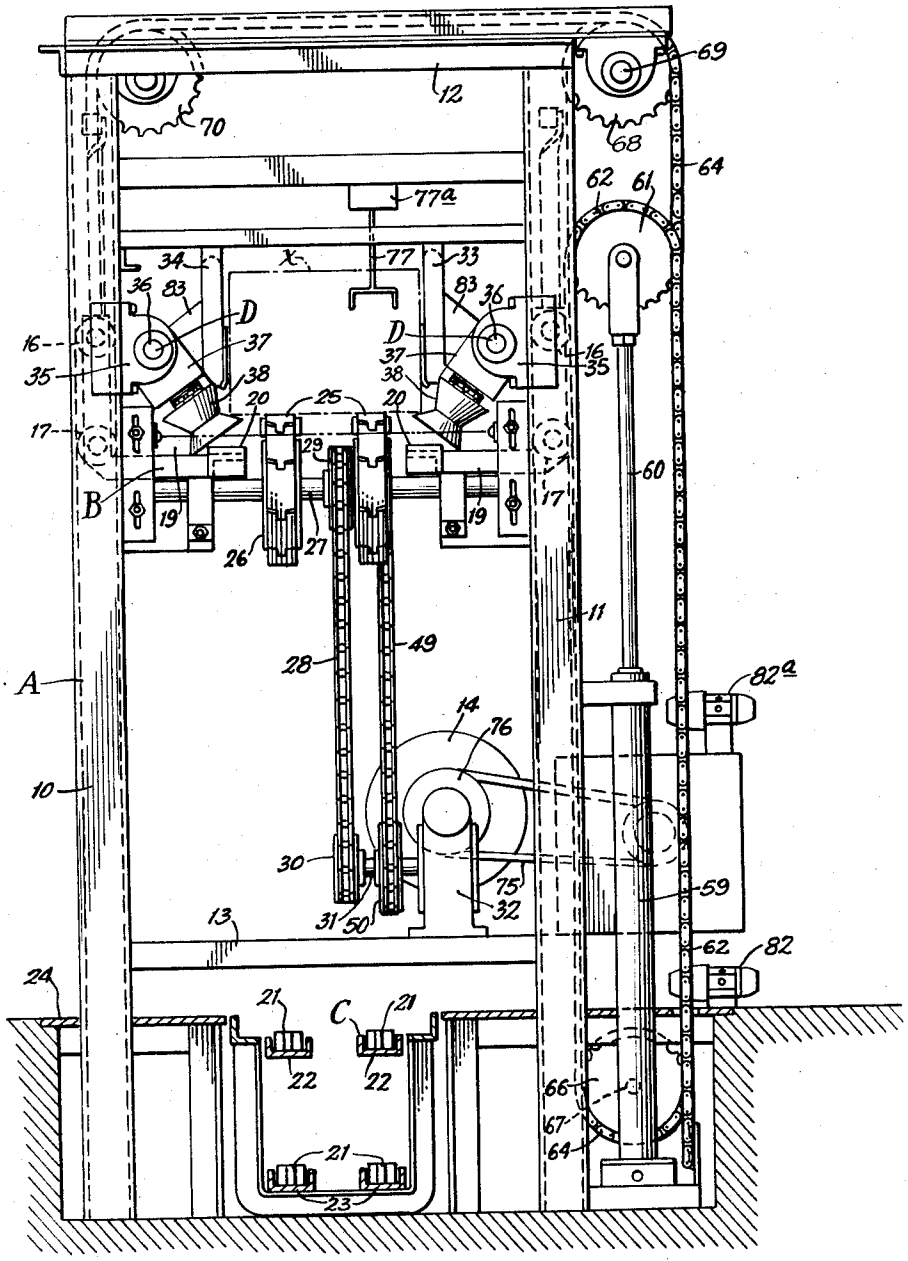
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Fig. 1



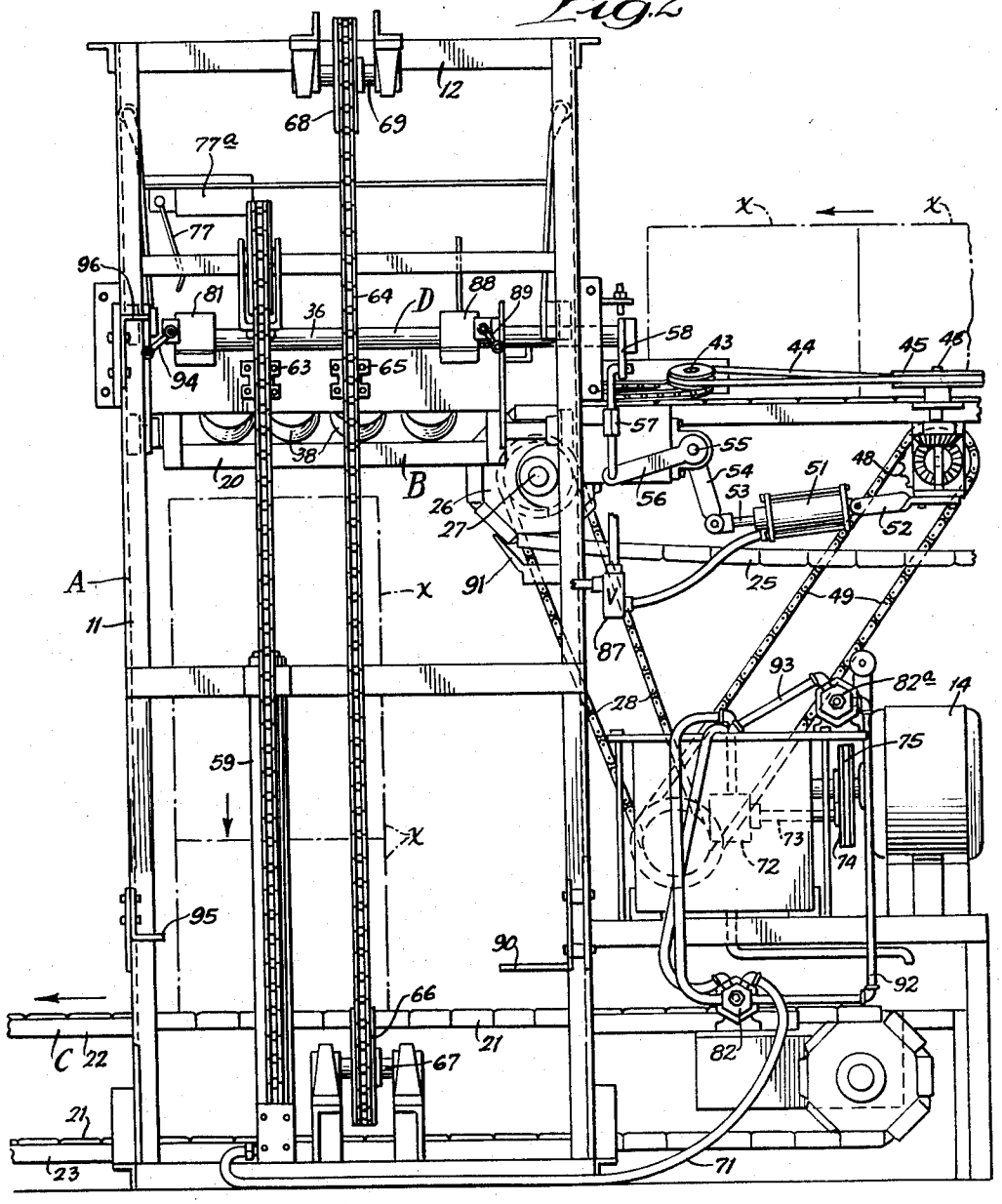
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Fig. 2



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Fig. 3

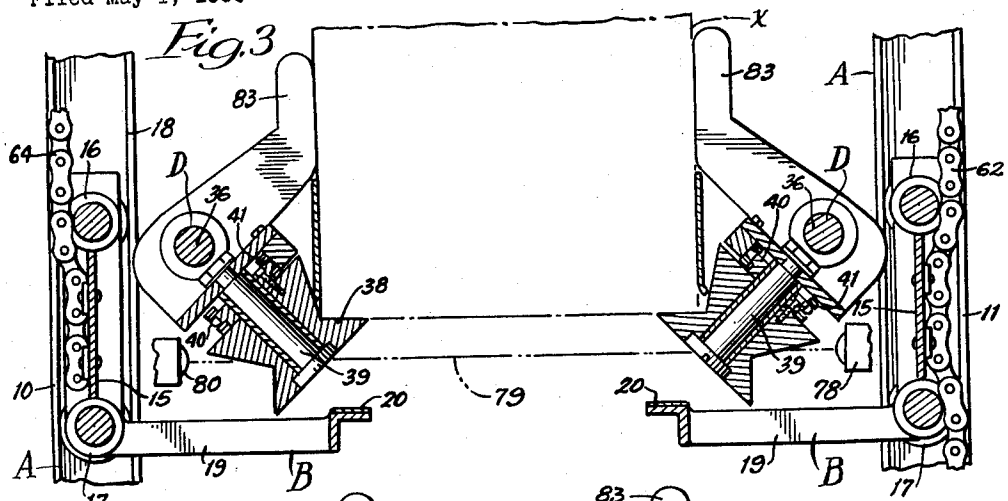


Fig. 4

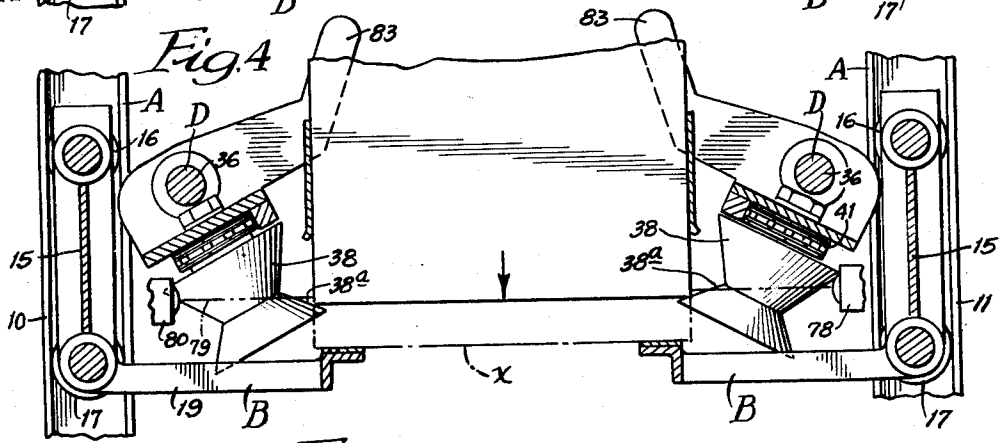
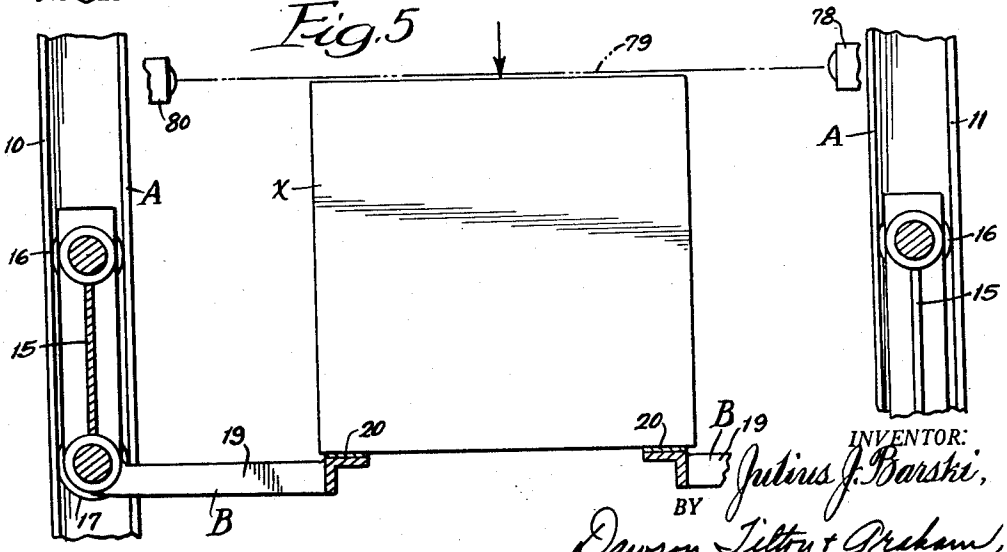


Fig. 5



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Fig. 6

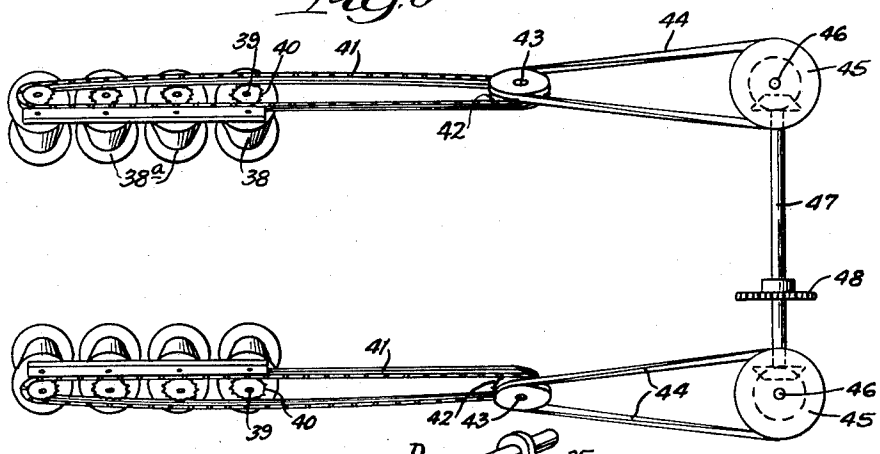


Fig. 7

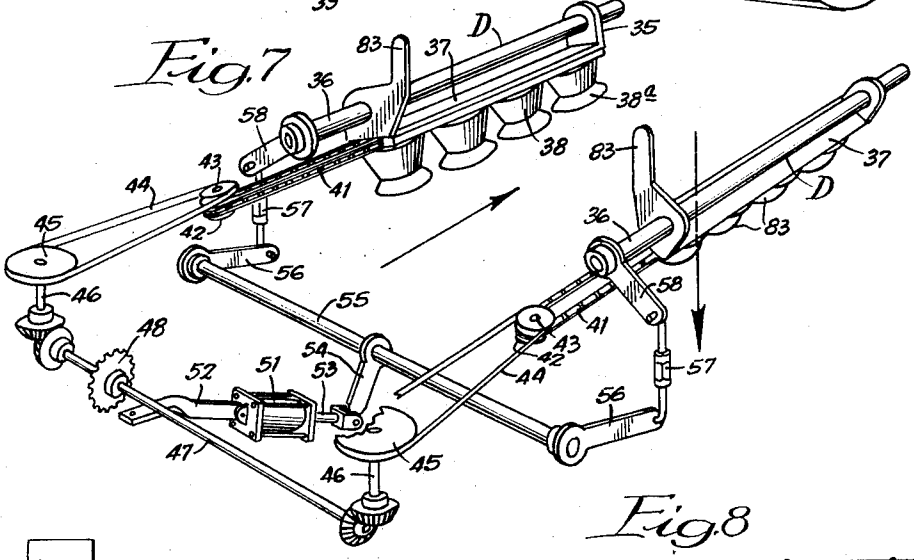
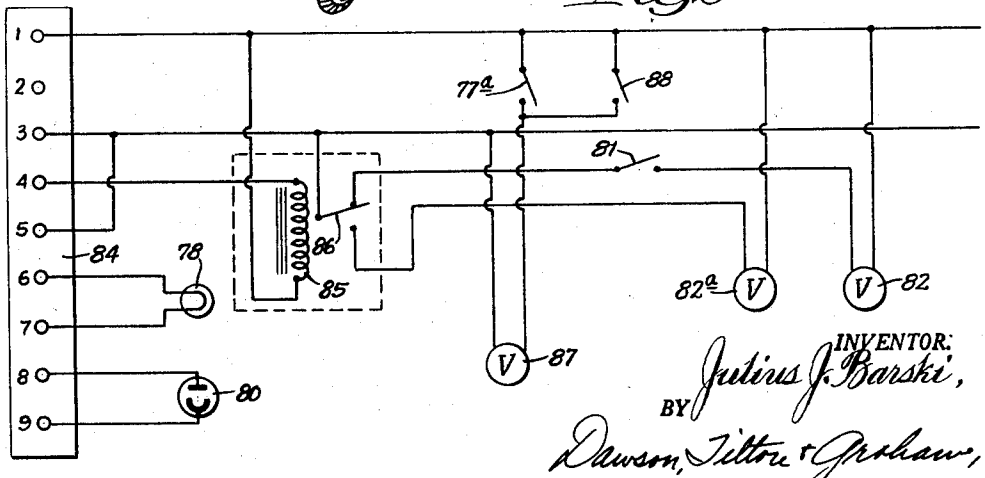


Fig. 8



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2,901,128

CASE STACKER

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Application May 1, 1956, Serial No. 581,925

8 Claims. (Cl. 214—6)

This invention relates to a case stacker, and is particularly useful in the stacking of cases arriving in single file, one upon the other, to form a stack which may be carried off on an exit conveyor.

An object of the invention is to provide mechanism by which cases arriving at the machine, one after the other, may be stacked upon each other so as to be carried away by exit delivery means. A further object is to provide in such stacker mechanism unique means by which cases may be lowered rapidly and gently upon each other in a stacking operation, the steps of advancing the cases and stacking them being carried on automatically. Yet another object is to provide in a stacker mechanism means for delivering cases to a stacker area and there depositing one case upon another in rapid succession and with a minimum of movement of the stacking elements so that the stacked cases may then be carried away in stacked or superposed relation. Other specific objects and advantages will appear as the specification proceeds.

The invention is shown, in an illustrative embodiment, by the accompanying drawings, in which—

Figure 1 is an end view in elevation showing the apparatus at the exit end of the machine; Fig. 2, a broken side view in elevation; Fig. 3, an enlarged transverse sectional view showing the lowering mechanism in engagement with a case; Fig. 4, a view similar to Fig. 3 but showing the case being lowered; Fig. 5, a view similar to Fig. 4 but showing the case after being lowered in the operation; Fig. 6, a top plan view of the tilting support mechanism and means for operating the same; Fig. 7, a perspective view of the tilting support mechanism and showing the same in released position; and Fig. 8, a plan view of a wiring layout which may be employed.

In the illustration given, A designates a vertical carriage frame, and B designates the carriage. In the operation of the structure, I provide means for raising and lowering the carriage so as to carry cases as they are stacked one upon the other to a lower position and upon a conveyor C. D designates a rocker mechanism providing a rotatable support for cases, the support being effective for lowering the cases one upon the other in the stacking operation.

The frame A comprises side standards **10** and **11**, there being two standards **10** and two standards **11**, each spaced apart to form a frame which is substantially square in cross section. The frame also includes the top member **12**. A platform **13** is supported by the lower part of the standards **10** and **11** and provides a support for the motor **14**.

The carriage B comprises a web member **15** equipped with rollers **16** and **17** mounted within a track **18** carried by the frame. The carriage is equipped with inwardly-extending arms **19** providing case support members **20**, as shown more clearly in Fig. 3.

The cases are adapted to be lowered by the carriage B to the bottom track C which may be of any suitable construction. In the illustration given, the track C consists of a chain conveyor **21** mounted upon tracks **22** and

return tracks **23**. The conveyor is preferably mounted so as to receive the cases X and to carry them forwardly close to the floor level **24**. Thus, when the cases have been stacked and deposited upon the conveyor C and then advanced by the conveyor C, it is easy for operators to move the stacked cases to one side or the other of the conveyor C.

Any suitable means for conveying the boxes X forwardly to the stacking machine may be employed. In the illustration given, I provide a pair of chain conveyors **25** and these pass over the sprocket wheels **26** carried by shaft **27**, the shaft **27** being driven by a chain **28** which engages sprocket **29** at its upper end and sprocket **30** at its lower end. The sprocket **30** is carried by the shaft **31** which extends into the gear reducer box **32** driven by the motor **14**.

As the cases X are advanced, they pass between the guide walls **33** and **34** and leave the conveyor shafts **25**, being moved forwardly by the tilted roller structure D. The roller structure D will now be described.

Brackets **35** are carried by the side rails **10** and **11**, and in each of the brackets is mounted a rotatable shaft **36**. The rotatable shaft carries supports **37** in which are mounted spindles for rotatably supporting spools **38**. The spindles **39** carry sprockets **40** which engage a continuous chain **41**, the chain **41**, engaging a sprocket **42** carried by a pulley shaft **43** which is suspended upon the pulley belt **44**. With this structure, the several spools **38** may be rotated for advancing cases thereon, while at the same time the spools may be rotated downwardly and upwardly upon their rock shafts **36**, as shown best in Fig. 7. By this means, the cases X may be advanced rapidly by the rotating spools **38** and then dropped from the spools **38** when the same are swung downwardly by the rotation of shafts **36**.

The belts **44** engage driven sheaves **45** which are mounted upon shafts **46** and which are driven through gear connections by the shaft **47**. Shaft **47** is equipped with a fixed sprocket **48** engaging the chain **49** driven by the sprocket **50** on shaft **31**, as shown best in Fig. 1.

Any suitable means may be provided for rocking the rock shaft **36** to effect lowering and raising of the spools **38**. In the illustration given in Fig. 7, I provide an air cylinder **51** supported upon bracket **52** carried by the frame, and the plunger **53** of the compressed air cylinder **51** engages lever **54** mounted on shaft **55**. The shaft **55** is equipped at each end with a crank arm **56** connected by the adjustable rod link **57** to the crank arm **58** on rock shaft **36**. The action of the air cylinder **51** is therefore effective in the rocking of the support **37** carrying the spools **38** and their spindles and sprockets.

Any suitable means may be provided for raising and lowering the carriage B. In the illustration given, I provide a fluid cylinder **59** which is equipped with a piston **60** carrying at its upper end a freely rotatable sprocket wheel **61** engaging a chain **62**, as shown best in Fig. 1.

The chain **62** is connected at one end to a bracket **63** on the carriage B. Similarly, another chain **64** is connected at one end to a bracket **65** on the carriage B and extends downwardly over an idler sprocket **66** supported upon shaft **67** and thence upwardly and over an idler sprocket **68** carried by shaft **69** supported on the top frame member **12** and thence over a second sprocket **70** similarly supported on the frame **12** and thence downwardly to a point where it is connected to the opposite side of the elevator or carriage B. Thus, upon the forcing of fluid into the cylinder **59**, it is possible to raise the piston **60**, or, by withdrawing liquid from the cylinder **59**, to lower piston **60** and thus raise and lower the carriage B. Fluid to the piston may be supplied through a conduit **71** leading from pump **72**, and the pump **72** is operated by a shaft **73** connected to pulley wheel **74**, the latter pulley

being connected by pulley belt 75 to the pulley 76 mounted on the shaft or motor 14. It will be understood that any suitable means for operating the pump to supply fluid to the power cylinder or to either end thereof may be employed to bring about the raising and lowering of carriage B.

The lever arm 77 of switch 77*a* is tiltably mounted for engaging the forward end of the foremost case and for interrupting the operation of the air cylinder 51 so as to bring about a rocking of shaft 36 and the lowering of the foremost case upon the carriage B. This is accomplished by means of a solenoid-controlled air valve 87 which is in circuit with switch 77*a*, as diagrammatically illustrated in Fig. 8, and which operates to interrupt the inflow of air to cylinder 51 when arm 77 is pushed forwardly by an oncoming case. It is to be noted that a switch 88, mounted upon the movable carriage, is also in circuit with the solenoid-controlled air valve, so that this valve will be open, and the support rollers 38 will be in raised or case-carrying position only when both of the switches 77*a* and 88 are open. Lever arm 89 of switch 88 is adapted to engage a lower carriage-frame bracket member 90 for opening switch 88 when the carriage reaches its lowermost position, and is also adapted to engage an upper bracket member 91 for closing the same switch as the upwardly moving carriage nears its uppermost position.

As shown in Figs. 3–5 and 8, I provide an electric lamp 78 which directs a light beam 79 towards an electric cell 80. When the light beam is interrupted, relay 85 actuates switch 86 so that a solenoid-controlled two-position valve 82 prevents the flow of hydraulic fluid from pump 72 into the carriage operating cylinder 59, and at the same time permits pressure fluid to escape from the cylinder and back into the reservoir through conduits 71, 92 and 93. Further, when the beam is broken, the relay switch actuates the solenoid exhaust valve 82*a* between conduits 92 and 93 to permit the return flow of hydraulic fluid therethrough.

In Fig. 2, I show a limit switch 81 equipped with a pivotal switching arm 94 which is engageable with a lower bracket member 95 for closing the switch and an upper bracket member 96 for opening the switch, both brackets being mounted upon the carriage frame. The limit switch is interposed in the electric circuit between the two-position solenoid control valve 82 and relay switch 86, so that valve 82 will operate to prevent the flow of pressure fluid into the cylinder 59 when either the light beam is broken or the limit switch is opened. However, it is to be noted that the limit switch is not in series with the solenoid exhaust valve 82*a*. Therefore, if switch 81 is opened while the light beam is uninterrupted, oil or other pressure fluid can neither enter nor escape from the piston chamber and the movable carriage will remain stationary.

Referring more particularly to Figs. 3, 4 and 5, it will be noted that the tilting support rollers 38 not only are effective in carrying the cases forward toward the switch 77, but also in their tilting position provide inclined bottom flanges 38*a* which ease the cases onto the carriage B or upon the cases already supported upon the carriage so that there is a minimum of dropping movement of the cases.

Operation

In the operation of the apparatus, the cases X enter the stacker on the conveyor 25 and are carried forward by the driven rollers 38 and into contact with switch arm 77. Switch 77*a* actuates the air valve 87 which cuts off the air supply to the air cylinder 51 to bring about a tilting or lowering of the roller supports, thereby lowering the case onto the carrier or carriage B. As the case is lowered, it interrupts the light beam 79, and relay 85 closes the circuit including solenoid valve 82*a* to open that valve and to permit fluid to escape from cylinder 59 and return to the reservoir. No current flows to solenoid valve 82 because switch 81 remains open and relay 85 instead directs current to the exhaust valve 82*a*. Valve 82 thereby prevents the introduction of pressure fluid into cylinder 59 and at the same time permits fluid to return from the cylinder to the reservoir. Hence, the carriage moves downwardly, carrying the foremost case with it, as indicated in Fig. 4, and when the case X moves below the light beam 79, as shown in Fig. 5, solenoid-controlled exhaust valve 82*a* is closed and the carrier stops. A new case is then fed forwardly and stacked in the manner just described upon the first case. The cases are kept separated in the feeding movement by the stop members 83. As shown in Fig. 3, the case is free to be fed forwardly, but when the first case is then being lowered, the stop members 83 extend inwardly (as shown in Fig. 4) to limit forward movement of the next case.

When the cases are all stacked, the carrier reaches its bottom position and the pivotal arm 94 of the limit switch engages lower bracket 95, thereby closing the limit switch 81. However, since the uppermost case in the stack still interrupts the beam 79, the carriage and the cases carried thereby continue to travel downwardly. During this continued downward movement, arm 89 of switch 88 contacts lower bracket 90 and pivots upwardly to close that switch. Hence, the support rollers remain in the lowered positions shown in Fig. 4, and stop members 83 prevent the foremost case of a new series of cases from moving forwardly off of conveyor 25. After the first stack has been carried away by chain conveyor 21, a light beam 79 is no longer broken and, because the limit switch 81 is at the same time in closed position, oil flows through valve 82 and into cylinder 59 to raise the empty carriage.

When the upwardly moving carriage passes bracket 91, switch arm 89 moves into open position. As a result, air valve 87 opens and the air driven piston moves the support rollers into the raised position illustrated in Fig. 3. At the same instant that the first case of the next series strikes the movable switch arm 77, the arm 94 of limit switch 81 engages the upper flange or bracket 96. Switch 81 is thereby opened and solenoid valve 82 interrupts the flow of oil into cylinder 59. As the first case of the next series breaks the light beam 79, exhaust valve 82*a* is actuated and the carriage moves downwardly carrying the foremost case with it. The operation described above is then repeated.

As already pointed out, the rollers or spools 38 receive the cases successively from the chain conveyor 25 and the foremost case on reaching the position shown in Fig. 3 engages the arm of switch 77. The spools 38 are then moved downwardly upon rock shaft 36 so that the stop members 83 swing forwardly to hold the next case back until the foremost case has been dropped. The remaining cases are then advanced one by one and deposited in the same manner to form a stack of two, three, four or any selected number of cases or articles to be stacked.

As above set out, the rock shaft through its rotating movement lowers the spools or rollers toward the carriage B or the case thereon, while at the same time the inclined lip or flange 38*a* on the rollers 38 are further effective in easing the cases upon the carriage or upon the stack of cases. At the same time, the release of the cases is effected by a very short mark of movement of the rock shaft and thus rapid stacking of the cases is accomplished.

While the foregoing specification, I have set forth the structure in considerable detail for the purpose of illustrating an embodiment of the invention, it will be understood that such details of structure may be varied widely by those skilled in the art without departing from the spirit of my invention.

I claim:

1. In an apparatus for stacking cases, a vertical

frame, a conveyor adapted to deliver cases successively to an upper portion of said frame, a carriage mounted in said frame for lowering cases, a conveyor at the lower exit side of said frame for receiving stacks of cases, a pair of rock shafts mounted in said frame, continuously-driven rollers rotatively supported upon said rock shafts and normally extending inwardly and downwardly to receive cases from said first mentioned conveyor and to center said cases above said carriage, means for rocking said shaft to tilt said rollers further downwardly into case-discharging positions for the discharge of cases upon said carriage, and means for lowering said carriage successively through a distance equal to the height of the case after each discharge from said rollers, and stop means provided by said rock shafts for limiting the advancement of cases by the delivery conveyor when said rollers are tilted.

2. The structure of claim 1 in which said rock shaft is controlled by a switch engageable by the foremost case, and in which said rollers are positively driven to advance the case against said switch.

3. The structure of claim 1 in which the rollers are in the shape of spools having at their inner ends inclined flanges for guiding the cases inwardly and downwardly.

4. The structure of claim 1 in which the rollers are positively rotated by flexible drive means which remain in operation during the rocking of said shaft.

5. In an apparatus for stacking cases, a vertical frame, a carriage mounted therein for vertical movement, a conveyor for feeding cases to said frame, a pair of parallel and horizontally-extending rock shafts mounted in said frame above said carriage and aligned longitudinally with said conveyor, said rock shaft being spaced apart and

each being equipped with a series of parallel spindles, said rock shafts each being rotatable between a first position wherein said spindles slope inwardly and downwardly and a second position wherein said spindles extend downwardly in substantially vertical directions, and a plurality of spools rotatably carried by said spindles.

6. The structure of claim 5 in which each of said spools is centrally and circumferentially grooved to define inner and outer cone-shaped flanges, said inner flanges providing substantially horizontal supporting surfaces and said outer flanges providing inwardly and downwardly inclined surfaces when said rock shafts are in said first positions.

7. The structure of claim 5 in which driving means are provided for continuously rotating all of said spools in the same direction and at the same speed.

8. The structure of claim 5 in which each of said rock shafts is provided with a stop plate, said stop plate extending upwardly when said shaft is in said first position and projecting inwardly when the shaft is in said second position.

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