Feb. 16, 1965 D. M. McLEAN 3,169,471

PALLETIZING APPARATUS

Filed Nov. 13, 1962 2 Sheets-Sheet 1

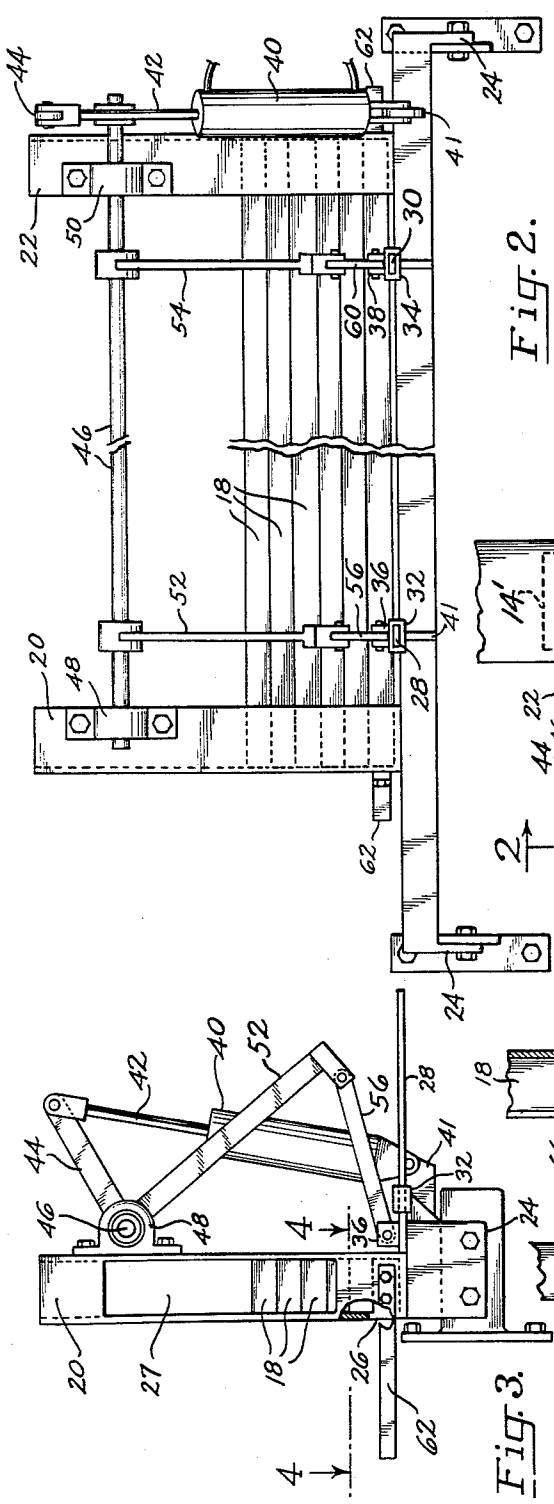


Fig. 2.

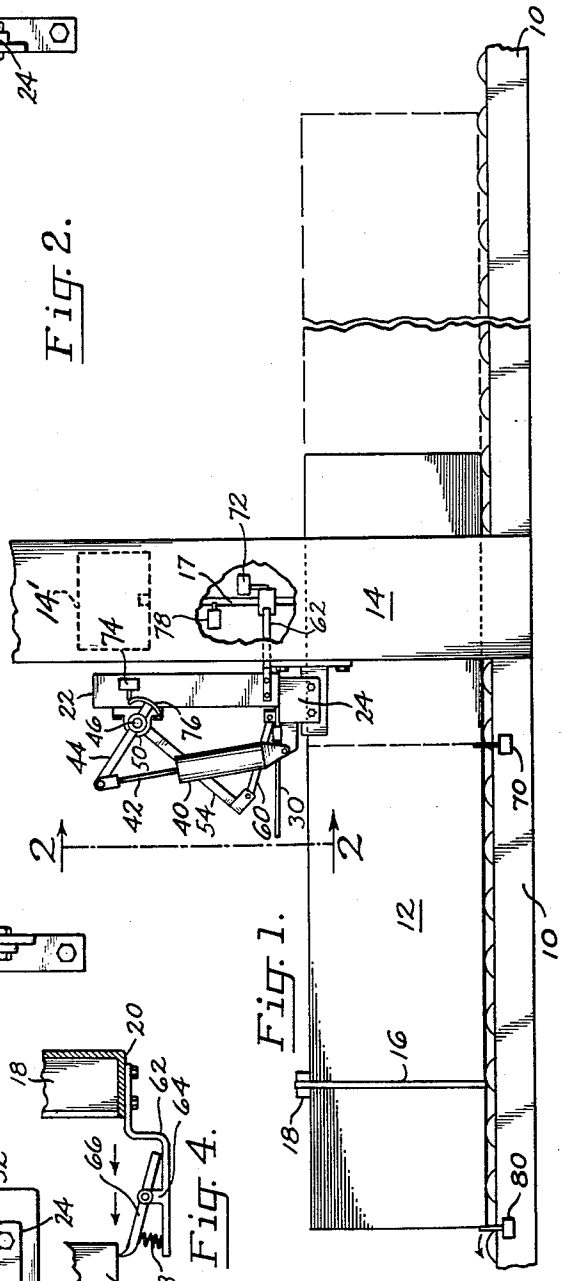


Fig. 1.

Fig. 3.

Fig. 4.

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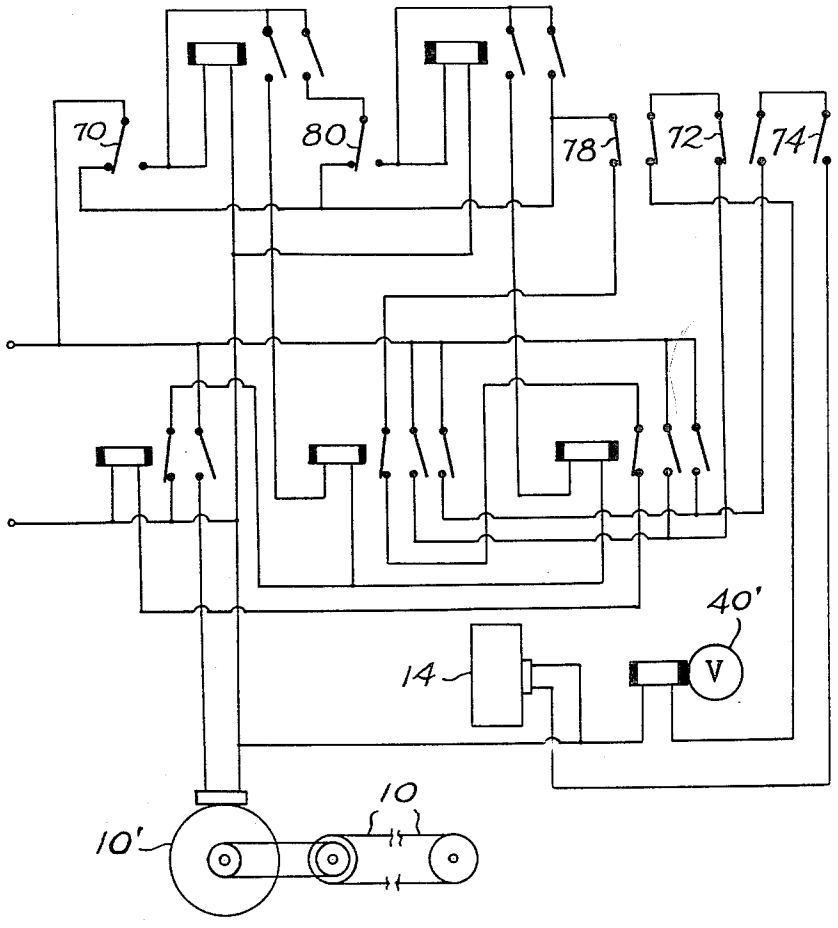


Fig. 5.

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PALLETIZING APPARATUS

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This invention relates to palletizing apparatus, i.e. to apparatus for binding large packages such as plywood or lumber stacks while at the same time building into the package an integral pallet making possible easy handling of the package with a lift truck.

In the manufacture of plywood, panel board and like products, it is usual practice to stack the finished panels with the edges registering and then to transfer the stack on a live roll assembly to a station at which it is bound with steel strap in an "Acme" or other conventional type of binding apparatus. The bound stack then is carried away by means of a lift truck to storage or to a transporting vehicle.

It is the general purpose of the present invention to provide apparatus for applying to a stack of panels or other package one or more pallet-forming feet, these being bound to the stack in the same operation that binds the panels together. As a result, there is formed a bound stack having an integral pallet, taking advantage of the fact that the stack per se possesses an exterior pallet forming surface which may be converted into a pallet by the mere application of the foot members.

Moreover, such an arrangement has the ancillary but important advantages of protecting the top panel of the stack from the damaging effect of a tightly wrapped steel strap or other binding member; of being readily adaptable to automatic operation on a conventional packaging line; and of being readily attachable to a conventional strapping machine.

Considering the foregoing in greater detail, and with particular reference to the drawings, wherein:

FIG. 1 is a view in side elevation of package strapping apparatus on which is mounted the herein described palletizing apparatus;

FIG. 2 is a view in end elevation of the palletizing apparatus of FIG. 1 looking in the direction of arrows 2—2 of the latter figure;

FIG. 3 is a detail view in side elevation of the palletizing apparatus of the preceding figures, but viewed from the opposite side of the apparatus;

FIG. 4 is a detail plan view partly in section, along line 4—4 of FIG. 3, and illustrating a holding assembly employed in the presently described apparatus; and

FIG. 5 is a schematic diagram of an electric circuit for operating the mechanism shown in the preceding views.

The apparatus of the present invention may be applied to forming integral pallets on any type of package or stack having a pallet-forming exterior surface, i.e. a flat, strong surface which in effect forms the platform member of the pallet created by the attachment of pallet-forming feet. The apparatus is particularly suitable for use, however, in palletizing stacks of plywood or wood composition board and is illustrated with reference to that application.

Thus there is provided a live roll assembly **10** driven by means such as electric motor **10'** (FIG. 5) and which conveys a stack **12** of panels from a stacking station to a binding station at which may be located an "Acme" or other strap fastener indicated generally at **14**.

The operation of the strap fastener normally occurs in stages, a first strap being wrapped about the leading end of the stack in the first stage and a second strap about the trailing end of the stack in the second stage. During

these operations the stack moves from the dotted line to the full line positions of FIG. 1.

The strap fastener employed is conventional and forms no part of the present invention except insofar as it affords an appropriate means for affixing the pallet-forming feet to the stack. Its operation is automatic and consists of encircling the stack with a strap **16** traveling in a guideway **17**. The strap is wrapped completely around the stack until the ends meet. It then is tensioned and the ends fastened together.

In the practice of the present invention a pallet-forming foot member is superimposed on the stack preliminary to wrapping the strap around it. The foot then is bound against the stack by operation of the strapper.

A wide variety of items may be used in the capacity of the pallet-forming feet. Where the packaging of plywood is contemplated, there advantageously may be employed lengths of 2 x 4 or other structural pieces **18**, cut to uniform size. Preferably this size is about the width of the plywood panel so that the piece overlies and protects the exterior panel.

The foot-forming pieces are stored in magazine means comprising a pair of spaced, parallel, vertically extending guideways **20, 22** mounted on brackets **24** which may be fixed to the frame of strapping machine **14**.

The guideways are dimensioned to receive an adequate stock of the pieces. Their lower front faces are open to provide a passageway **26** (FIG. 3) through which the lowermost member of the stack may be pushed. The side face of one of them, guideway **20**, is cut away to provide a magazine-charging opening.

The pushing apparatus employed comprises a pair of push rods **28, 30** which slide in guides **32, 34** respectively, affixed to the frame of the apparatus. The leading ends of the push rods underlie and support the stack of foot members **18**. The trailing ends are of sufficient length to enable a push rod stroke of predetermined length.

Clevis-like abutments **36, 38** are mounted centrally on the upper surfaces of the push rods. They are designed to abut and push against the rearward side face of the lowermost foot member **18**, advancing it from its storage station in the magazine to an advanced station at which the strapping machine is operative.

Although various reciprocating drives may be employed for driving the push rods, that illustrated includes a fluid-operated cylinder, preferably an air cylinder **40**, the reciprocative operation of which is controlled by such means as the solenoid valve **40'** (FIG. 5). Its base is pivoted to a bracket **41**. Its piston rod **42** is coupled to a lever arm **44**. This in turn is fixed to a rock shaft **46**, the ends of which are journaled in bearings **48, 50**.

Keyed to the rock shaft are a pair of angular lever arms **52, 54** which, in turn, are pivotally connected to one end of connecting bars **56, 60**. The other ends of these bars are pivotally connected to clevis-like abutments **36, 38** described above.

Accordingly reciprocation of piston rod **42** induces a horizontal reciprocating motion of push rods **28, 30**, and hence of abutments **36, 38**.

During their advancing motion, the abutments push the lowermost foot member **18** from beneath the stack in the storage magazine, discharging it through openings **26**. During this action the projecting leading portions of the push rods support the discharged foot member. Also, connecting bars **56, 60** assume an almost horizontal position and underlie the remaining members of the stack contained in the magazine, supporting them during the cycle of operation.

As indicated above, the discharged foot member is transferred to the binding or packaging station where it

is held in position by means of spring-pressed fingers indicated particularly in FIG. 4.

There is one such finger assembly on each side of the apparatus. Each includes an angular bracket **62** from the central portion of which extend a pair of short arms **64**.

Pivoted between these arms is a finger **66** having a pointed tip which is pressed resiliently into gripping engagement with the ends of each member **18** by means of a compression spring **68**.

It is a particular feature of the present invention that the apparatus can be run automatically in conjunction with a plywood or other packaging line.

Thus when package **12** traveling on live roll assembly **10** contacts a limit switch **70**, the motion of the package is arrested in the dotted line position of FIG. 1. In this position, the first strap is applied.

Switch **70** also actuates cylinder **40** with the result that pushing arms **28**, **30** mounting abutments **36**, **38**, push the lowermost foot member **18** outwardly through openings **26** and between spring pressed fingers **66**. These hold the member in place as shown in FIG. 4, while the pusher arms are withdrawn by reverse action of the cylinder, completing the cylinder cycle.

The discharging movement of foot member **18** is used to energize a second limit switch **72**. This reverses cylinder **40** so that it returns to its original position.

As it does so, a third limit switch **74** is energized by contact with a shoe **76** carried by an extension of lever arm **44**. This limit switch actuates strapping machine **14** so that the strap traveling through guideway **17** is wrapped about the package and about the superimposed foot member **18**, lengthwise thereof.

Prior to movement of the strap through guideway **17** a package-compressing member **14'** of the strapper moves downward toward the package, pushing the foot member **18** downward and out of engagement by the fingers **66**. This downward movement of the package-compressing member opens switch **78** which, after a predetermined delay sufficient for the strapper to apply the strap and retract the compressing member, closes and starts live rolls **10**. The package then moves along the live rolls until it reaches the full line position of FIG. 1, where it engages a fifth switch **80**. This corresponds in function to live roll switch **70** and initiates again the sequence described above.

The finished package then is discharged from the apparatus. It is securely bound with two straps, each of which also ties down a transversely arranged foot member **18**, making of the package an integral pallet which greatly facilitates lift truck handling during transportation and storage operations.

It is to be understood that the form of my invention herein shown and described is to be taken as a preferred example of the same and that various changes in the shape, size and arrangement of parts may be resorted to without departing from the spirit of my invention or the scope of the subjoined claims.

Having thus described my invention, I claim:

1. For use with package binding apparatus having a package binding station, package palletizing apparatus comprising:

(*a*) magazine means for holding a pallet-forming foot member spaced from the package binding station of the binding apparatus,

(*b*) advancing means positioned for advancing the foot member from the magazine means to said binding station wherein it lies across a pallet-forming surface of the package spaced from the latter and in the plane of a binder to be wrapped about the package, and

(*c*) holding means arranged for holding the foot member releasably in the package binding station for wrapping a binder around the package and foot member, whereby upon operation of a package-binding member of the binding apparatus the foot member is drawn from the holding means against the package and the binder is applied, thereby contemporaneously binding the package and forming an integral pallet therefor by binding the foot member to the pallet-forming surface.

2. The palletizing apparatus of claim 1 wherein the magazine means comprises a pair of vertically arranged guideways dimensioned to hold a stack of the pallet-forming foot members, and means for mounting the guideways in parallel spaced relation above the advancing means.

3. The palletizing apparatus of claim 1 wherein the advancing means comprises a guide means mounted below the magazine means, pushing arm means working in the guide means and positioned to engage the pallet-forming foot member, lever means connected to the pushing arm means and reciprocating motor means connected to the lever means, for actuating the pushing arm means in reciprocating motion between a retracted station adjacent the magazine means and an advanced station adjacent the holding means.

4. The palletizing apparatus of claim 1 wherein the holding means comprise a pair of spring-pressed fingers arranged to releasably grip the opposite end faces of the pallet foot member.

5. For use with package binding apparatus, package palletizing apparatus comprising:

(*a*) magazine means for holding a stack of pallet-forming foot members, the magazine means comprising a pair of spaced, vertically extending guideways dimensioned to receive the foot members and having an opening on one side,

(*b*) a pair of guides underlying the magazine means,

(*c*) a pair of pusher arms slidably mounted one in each of the guides on the side opposite the opening in the magazine means,

(*d*) lever means connected to the pushing arms,

(*e*) motor means connected to the lever means for working the pusher arms in reciprocating motion between a retracted station underlying the magazine means and an advanced package binding station removed from the same, wherein the foot member is disposed above and across the package in the plane of a binder to be wrapped about the package,

(*f*) and a pair of oppositely-arranged, spring-pressed holding fingers mounted at the package binding station for releasably gripping between them a pallet-forming foot member advanced by the pushing arms, whereby upon operation of a package-compressing member of the binding apparatus the foot member is drawn from the holding fingers against the package and the binder is applied to form an integral pallet.

6. The apparatus of claim 5 wherein the motor means comprises a double acting, fluid operated cylinder.

7. Apparatus for palletizing a package, comprising:

(*a*) binding means having a binding station in which a flexible binder is adapted to be wrapped about a package,

(*b*) means for holding a pallet-forming foot member spaced from the package binding station, and

(*c*) advancing means positioned for advancing the foot member from the holding means to said binding station wherein it lies across a pallet-forming surface of the package spaced from the latter and in the plane of a binder to be wrapped about the package, whereby tightening of the binder about the package and foot member forms a bound package including an integral pallet foot.

8. The apparatus of claim 7 including control means operatively associated with the advancing means and operable upon movement of a foot member to the binding station to actuate the binding apparatus to wrap a binder about the package and foot member.

9. For use with package binding apparatus having a package binding station, package palletizing apparatus comprising:

(*a*) means for holding a pallet-forming foot member spaced from the package binding station of the binding apparatus, and

(*b*) advancing means positioned for advancing the foot member from the holding means to said binding station wherein it lies across a pallet-forming surface of the package in the plane of a binder to be wrapped about the package, whereby tightening of the binder about the package and foot member forms a bound package including an integral pallet foot.

10. The apparatus of claim 9 including control means for the binding apparatus disposed for engagement by a foot member advanced to said binding station and

operable by engagement of said foot member to actuate the binding apparatus to wrap a binder about the package and foot member.

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