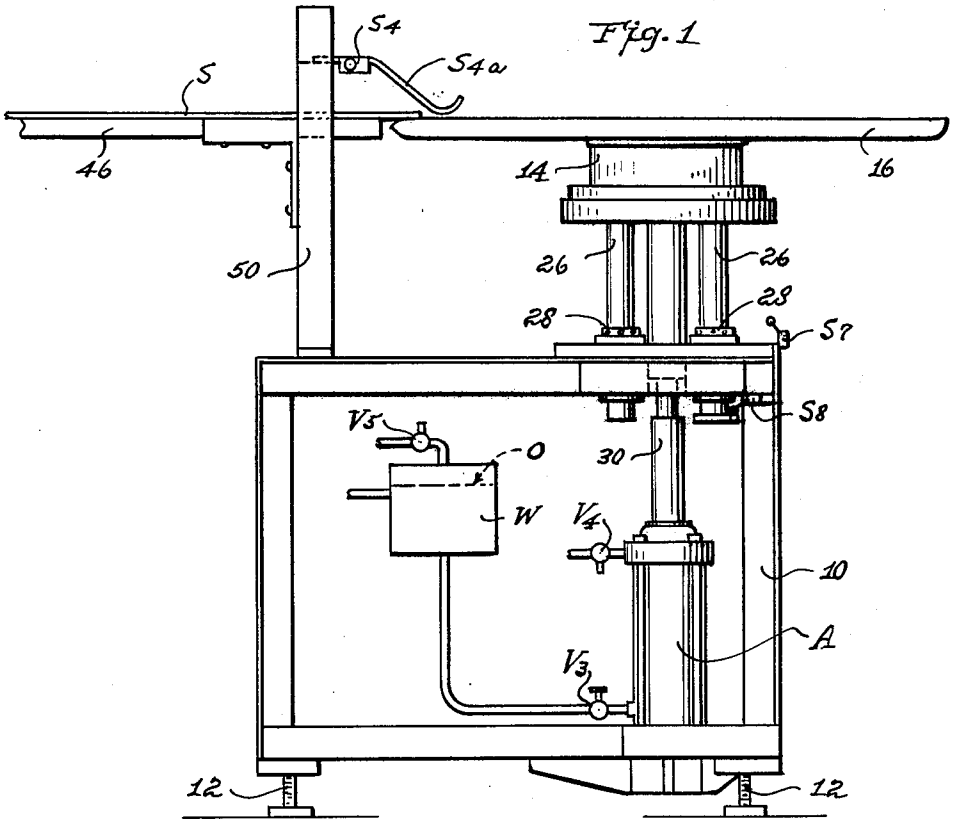
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STACKING AND UNLOADING APPARATUS

Original Filed April 3, 1959

Fig. 1



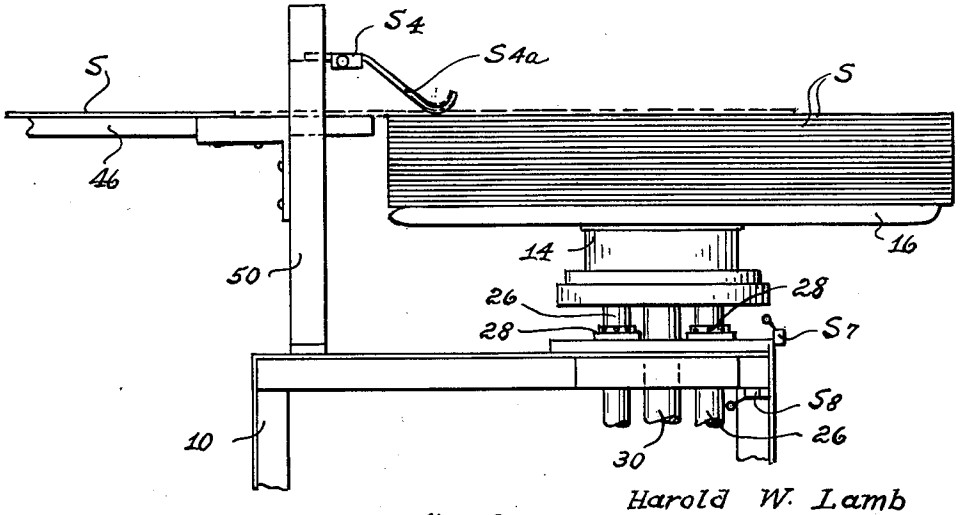


Fig. 2

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STACKING AND UNLOADING APPARATUS

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Original application Apr. 3, 1959, Ser. No. 804,009, now Patent No. 3,013,671, dated Dec. 19, 1961. Divided and this application June 29, 1961, Ser. No. 120,692

1 Claim. (Cl. 214—6)

This invention relates to apparatus for stacking flat sheets or plates, and one of the principal objects of the present invention is to provide efficient apparatus for automatically stacking a predetermined number of sheets or plates on a vertically movable platform, thereby not only greatly facilitating the operation of stacking sheets or plates, but also eliminating the necessity of counting them.

A further object of the present invention is to provide apparatus of the character described by means of which, in reverse operation, a stack of sheets or plates may be unloaded from the platform.

This application is a division of my copending application Serial No. 804,009 filed April 3, 1959 now Patent No. 3,013,671.

Through conventional electrically and fluid pressure controlled actuating elements in cooperation with the various layers of sheets deposited on the platform, the platform is lowered in step by step movements, corresponding to the thickness of the sheets, during the stacking operations.

As already mentioned, it is within the scope of my invention to unstack, or unload, sheets or plates from the platform, one by one while maintaining the surface of the top sheet in a stack at the same height as the sheets are removed singly therefrom. The means for effecting step by step vertical movements of the platform in the reverse arrangement mentioned are designed to raise the platform corresponding to the thickness of a sheet as each sheet is removed from a stack. Such a modified form of the invention is of particular advantage and convenience, for example, in the unloading of heavy hides or metal sheets from the platform or from a pallet or other support on the platform.

In the preferred form of my improved stacking and unloading apparatus I employ an air or other fluid pressure operated cylinder controlled by special electrical valves of conventional types for effecting cooperative vertical movements of the platform in either direction.

Other objects and advantages of my improved stacking and unloading apparatus will appear or be pointed out in the following specification in which reference is had to the accompanying drawings forming a part thereof, and in which

FIG. 1 is a side elevation of one embodiment of stacking and unloading apparatus in accordance with my invention, and showing a sheet at the beginning of a stack on the platform; and

FIG. 2 is a side elevation of the top portion of the apparatus and showing the stack of sheets almost completed.

As already mentioned, in the embodiment of my improved stacking and unloading apparatus as illustrated, I employ an air or other fluid pressure operated cylinder controlled by electrically operated valves and electrical switches all of conventional design arranged for proper actuation of the cylinder in sequential order to accomplish the desired purpose of the apparatus, and this cylinder and its operating and control elements will be described in the following specification.

Referring to the drawings in which like reference characters designate the same parts or elements in the several views, the apparatus, as illustrated, includes a base, which in the present embodiment is in the form of a frame **10** of sufficient height for convenience and provided with adjustable legs **12** for leveling the base. Upon the upper end of this base a platform support **14** is mounted for vertical, but non-rotatable, movement thereon. A platform **16** is mounted on the upper end of the support **14** to receive the layers of sheets S in the course of their stacking on the platform **16**.

The support **14** is held in vertically movable relation on the base **10** by a plurality of guide rods **26** projecting slidably through bearings **28** in the top of the base **10**. A piston rod **30** connects the platform support **14** with a hydro-pneumatic cylinder A for effecting back and forth vertical movement of the support **14** and associated platform **16**.

The means for operating the hydro-pneumatic cylinder A include a well W partially filled with oil O or other suitable liquid, this well being in communication at its bottom, through an increment control valve V3, with the bottom of the cylinder A and at its top, through a 3-way control valve V5, with a source of air pressure. The top of cylinder A also is in communication, through a 3-way control valve V4, with a source of air pressure. It should be understood that, as shown in FIG. 1, control valve V4 is open and valve V5 is closed, with its relief outlet open to the atmosphere. Valve V3 is also closed except when actuated as hereinatfer described. It should also be understood that the platform **16** is in its uppermost position for the beginning of a stacking operation of sheets S, a succession of which may be slidably moved by any suitable means (not shown) across a table **46**, mounted between standards **50**, toward the platform **16**, the top surface of the table **46** being substantially flush with the top surface of the platform when the latter is in its uppermost position, as shown in FIG. 1.

As the sheet S slidably passes under the lever S4*a* of a retarded action switch S4, which is connected in series with the control valve V3 between cylinder A and well W, this switch will be activated to permit flow through the valve V3, but will not become effective until the sheet S has entirely traversed the platform **16**. The retarded action of the switch S4, being adjusted according to the rate of travel of sheet S across the platform **16**, will then cause the valve V3 to permit the flow of a sufficient quantity of liquid from cylinder A to well W to lower the platform **16** a distance equal to the thickness of the sheet. Since the extent of lowering of the platform is controlled by the lift of the lever S4*a*, the movement will vary according to the thickness of the sheet under the lever at the time of its actuation. When the lever S4*a* of the switch S4 loses contact with the top surface of the sheet the valve V3 will close.

The sequence of operation described above will continue until a stack of sheets is completed and the stack of sheets may then be slidably or otherwise removed from the platform, after which the operation will be as described hereinafter.

Upon the final downward movement of the platform **16** a portion of it will actuate a switch S7, which is connected with valves V5, V3 and V4. This closes valve V4 and exhausts to the atmosphere, through its relief outlet, the air pressure from the top of cylinder A, also closing the relief outlet of valve V5 and admitting air pressure into the top of well W, and fully opening valve V3 to permit free flow of liquid from well W into cylinder A, so that its piston (not shown) will be forced to its uppermost position. Then, switch S8 which is connected with valves V3, V4 and V5 will again close valve V3, air pressurize the top of cylinder A, and release to

the atmosphere the air pressure from the top of well W. Thereafter, another sheet stacking operation will proceed as hereinbefore described.

It will be apparent from the foregoing description that a distinctive and important function of switch S4 is to effect, through its connection with valve V3, a vertical downward movement of platform 16 a distance equal to the thickness of a sheet S pushed under the switch actuating element S4*a*. It will also be seen that a distinctive and essential function of switches S7 and S8, through their connections with valves V3, V4 and V5 is to raise the piston of cylinder A to its starting position to place it in condition for another cycle of stacking operation. The same valve and other operating elements referred to may thus be advantageously employed in the stacking of sheets or other flat objects of any character or thickness on the platform 16, either mechanically or manually, under any conditions where it is necessary or desirable to keep the top sheet in substantially the same plane for the convenience of the stacking operation, irrespective of whether the platform is rotatable or the means by which the sheets are deposited on the platform.

It will, moreover, be apparent from the foregoing description that by a simple reversal of the operation of the valves and other elements referred to a stack of sheets, such, for example, as hides or the like, can be unloaded from a stack on the platform 16, or from a support thereon, while the top of the stack of sheets on the platform is maintained at substantially the same level. In such a reverse operation the platform 16 will be in its lowest plane at the start of the unloading or unstacking operation, and by means of switch S7 the top end of well V will be pressurized through valve V5, and the relief port of valve V4 opened, as previously described. Then, each time a sheet is withdrawn from the stack the switch actuating element S4 will drop (instead of rise) thereby causing valve V3 to admit a sufficient quantity of liquid from well W into cylinder A to force platform 16 upwardly a distance equal to the thickness of the sheet. When the last sheet is withdrawn from the stack the switch element S4*a* will cause the platform to rise slightly and render this switch inactive, while at the same time switch S8 will be activated, thereby releasing the air pressure from the top end of well W through valve V5 and pressurizing the top end of cylinder A through valve V4, thus causing the platform 16 to be lowered against the static head of the liquid in well W until it reaches its lowermost, or starting position, when switch S7 will again be activated to pressurize the top end of well W through valve V5 and release the air pressure from the top end of cylinder A through valve V4, thereby placing cylinder A in condition for another cycle of unloading or unstacking operation, as already described.

Since the operation of stacking or unstacking of sheets on or from the vertically movable platform 16, irrespective of whether the vertical step by step movements are in one direction or the other, involves no additional features of construction in the embodiment of my invention shown in the drawing required to adapt it to the specific uses described above, it is believed that no additional illustration is necessary.

It should be understood that if the platform 16 is of

sufficient weight to overcome the static head of the liquid in well W by gravity it would be possible to dispense with the air pressurizing of the top end of cylinder A, in which case only the air relief port in the place of valve V4 would be necessary to prevent the piston of the cylinder from becoming air bound in its upward movement. Obviously, that would not involve the addition of structural features to any of the operating elements shown and described.

As previously explained, the hydro-pneumatic cylinder A, as well as the electrical control valves and actuating switches referred to in the foregoing description, and which are shown schematically in FIG. 1, are all of conventional types procurable on the market and connected in a suitable electrical circuit (not shown).

Obviously, various modifications or changes in the construction and operation of my improved stacking and unloading apparatus may be made within the spirit and scope of my invention. Therefore, it should be understood that my invention is restricted only by the appended claim.

I claim:

In apparatus of the character described having a base and a sheet supporting platform mounted for vertical movement thereon and having means on said base cooperative with sheets stacked thereon to effect the lowering and raising of said platform, said means including a hydro-pneumatic cylinder vertically mounted on said base and having a piston rod connected to said platform, said cylinder also having an electrical combination air pressure and relief valve communicating with a source of air pressure and the top of said cylinder, said means also including a well partially filled with liquid, and a conduit communicating with the bottom ends of said cylinder and well, an electrical flow control valve in said conduit, and an electrical combination air pressure inlet and relief valve communicating with a source of air pressure and the top of said well; an electrical retarded action switch mounted on said base and having an actuating lever, the actuation of said switch being effected by the forcible lifting of said lever responsive to the thickness of sheets in slidable contact thereunder between said lever and platform, said switch being in an electrical circuit with said flow control valve and comprising the sole switch means for actuating said valve to permit a sufficient flow of liquid between said well and cylinder to effect vertical movement of said piston rod and platform in one direction a distance equal to the thickness of a sheet actuating said electrical switch; and a pair of vertically spaced switches on said base connected in the electrical circuit with said liquid flow control valve and with said combination air pressure inlet and relief valves for the actuating of said valves; and abutment means carried by said platform for actuating said switches in cooperative opening and closing of said valves at the end of each stroke of said piston rod in effecting vertical movements of said platform in either direction.

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