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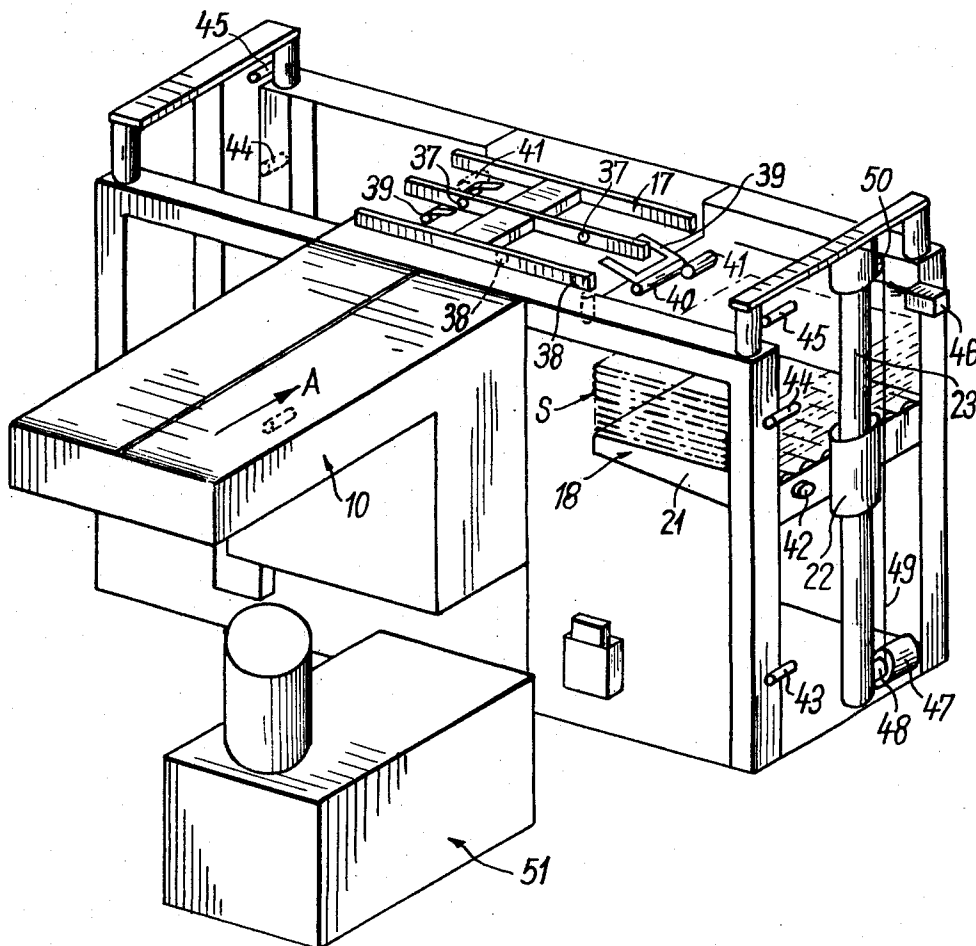
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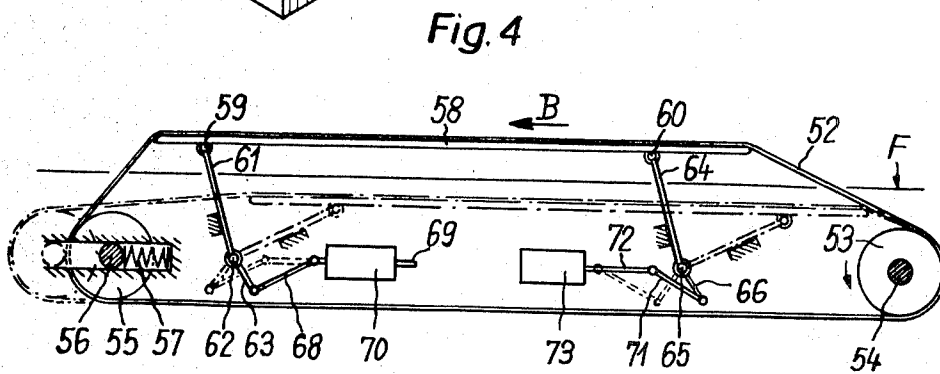
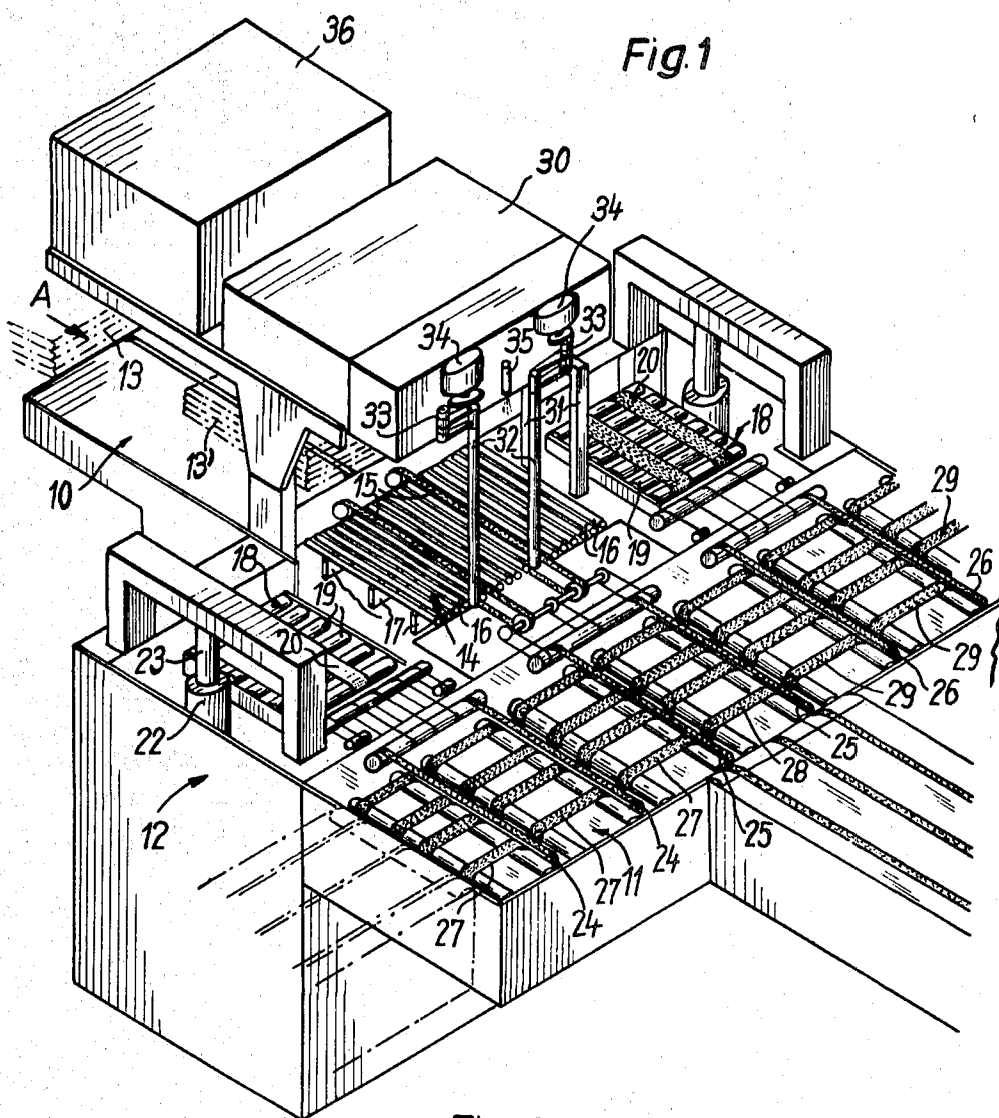
[54] **DEVICE FOR THE MANIPULATION OF LAMINAR OBJECTS PARTICULARLY FOR LAYING-UP THE SAME IN A PILE**
8 Claims, 4 Drawing Figs.

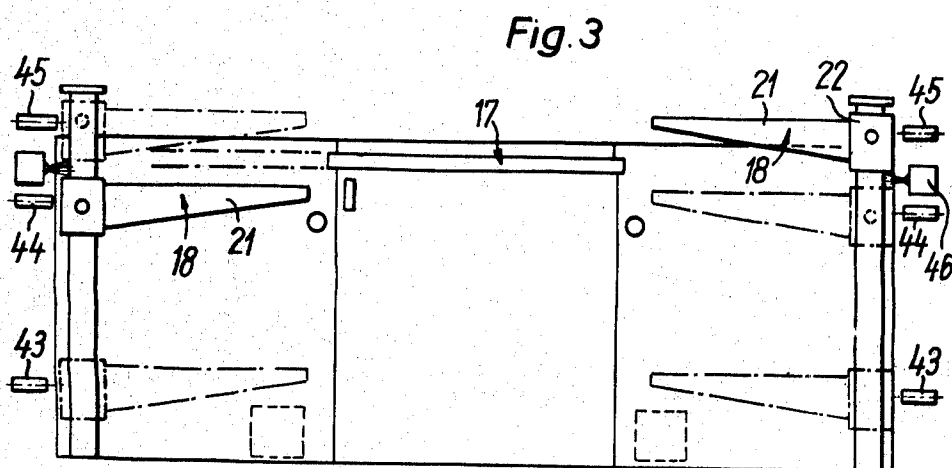
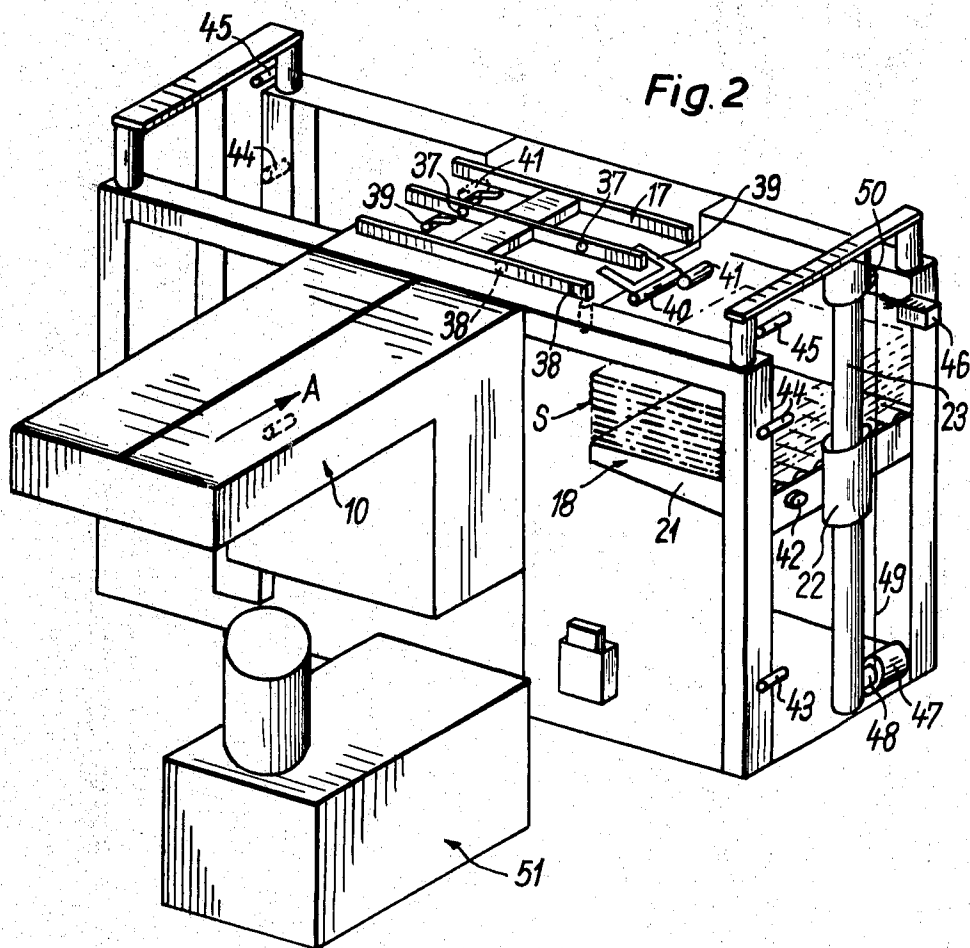
[52] U.S. Cl. 214/6
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ABSTRACT: A device for handling of laminar objects, particularly for laying-out newspapers to a pile, comprises a supply grate horizontally movable to-and-fro in the direction towards and above a receiving surface for the pile and away therefrom, packages of newspapers being successively delivered on said supply grate which moves them to a position above said receiving surface, means being provided for depositing said packages of newspapers on said receiving surface upon initiation of the retracting movement of the supply grate away from said receiving surface.







DEVICE FOR THE MANIPULATION OF LAMINAR OBJECTS PARTICULARLY FOR LAYING-UP THE SAME IN A PILE

The present invention relates to a device for the handling of flat objects, particularly for stacking bundles of the same in a pile.

The problem of stacking flat objects, coming from a conveyor arrangement singly or in bundles, occurs in many technological fields, particularly in printing plants, where the printed products are frequently conveyed in the form of piles from one working position to a neighboring working position. Basically, however, the problems of the formation of a pile arises in practice with all flat objects, that is with sheets of paper or plastic, with panels, e.g. of sheet metal, wood or plastic and other similar formed objects.

In many devices of the kind named, the objects to be stacked are first diverted from the plane in which they are conveyed so that the objects come to rest, perhaps at one of their lateral edges, and then they are further conveyed in a direction at right angles to their surface until they come up against a stop where the objects arriving gradually accumulate in a pile. Subsequently, the pile thus formed can be further handled, e.g. tied up and/or further conveyed. These devices are operative but with to some extent justifiable technical expenditure, only for such objects as allow of conveyance on the lateral edges, which again depends on the natural stability of the object and on the acceptability of possible damage to the lateral edges.

In contrast, the device according to the present invention is characterized by a supply unit one side of which is designed for the reception of the objects to be supplied and which can be moved forward and withdrawn therefrom over at least one receiving surface for the pile, wherein means are provided for removing the supplied objects from the supply unit at the beginning of the backward movement of the supply unit, and wherein the receiving surface is movable in a direction towards the other side thereof, no later than at the beginning of the backward movement of the supply unit.

It is convenient to form the supply unit as a gridlike unit, movable back and forth, guided in a horizontal plane parallel to the plane of the objects and the means for removing the objects from this unit as retractable stops in the path of movement thereof.

The invention will now be described as a component of a transport system for newspapers, periodicals and the like, with reference to the accompanying drawings, which illustrate the invention but in no restrictive sense.

FIG. 1 shows a diagrammatic, perspective view of a so-called "cross layer,"

FIG. 2 a simplified perspective representation of the device of FIG. 1 seen from the supply side,

FIG. 3 a simplified representation of a part of the device with the delivery surfaces for the piles in various positions,

FIG. 4 is an elevation view of a constructional detail of conveying agents coming into use in the cross layer represented.

As stated, the whole section of the installation represented in FIG. 1 can be designated as a so-called cross layer. Such a device serves for the purpose of forming, from slightly wedge-shaped objects, in this case from bundles with a number of newspapers, a rectangular pile so that the individual bundles can be laid alternately, turned through 180° in each case in the horizontal plane. In the finished pile, the thicker sides of the individual bundles, i.e. in this case the sides with the fold, come to rest alternately on opposite lateral surfaces of the pile, so that the differences of thickness of the individual bundles compensate reciprocally and the pile will have the shape of a straight prism.

The cross layer is organized basically in three parts, and there is provided, at the supply side, a so-called turning conveyor and at the delivery side, a belt or roller conveyor installation divided into sections, which is divided, on the one hand,

for the requirements of the device for delivery arranged between the turning conveyor and the conveyor installation, on the other hand, for the requirements of the handling stations provided after the formation of piles.

In FIG. 1 the turning conveyor is denoted by 10 and is represented only very diagrammatically. A detailed description of such a turning conveyor is to be found in my pending application Ser. No. 692,097, so that a further description at this point is superfluous. It may merely be pointed out that the turning conveyor 10 serves for the purpose of turning newspaper bundles 13 arriving in the direction of the arrow A with, for example, a front-running fold, alternately through 90° in the one and in the other direction, so that the folds of the newspapers in the bundles at the exit from the turning conveyor, seen in the conveying direction, come to rest alternately on the right (as shown by broken line 13') and at the left.

The device 12 adjoining the turning conveyor 10 comprises at the exit of the turning conveyor 10, a combined conveyor arrangement 14 which has small conveyor belts 15 (in this case two) driven in the direction of the arrow A and several rollers 16, running parallel with the belts 15, either positively driven or freely rotatable. It is to be noted that, while the conveyor direction of the small conveyor belts 15 runs parallel to the arrow A, each of the roller paths formed by the rollers 16 runs at right angles thereto. The conveying strip of the small conveyor belts 15 may, as described later, rise above the plane formed by the roller track of the rollers 16 and fall below this plane so that a bundle 13 picked up by the turning conveyor 10 can be advanced at a right-angle to the arrow A.

Directly below the conveyor arrangement is provided a supply unit formed in the shape of a delivery fork 17, which is displaceable back and forth in the direction of its prongs. In FIG. 1 the delivery fork is represented in its withdrawn middle position, therefore only the three ends of its prongs are visible.

In the extended position, the delivery fork 17 overlies one of two reception surfaces which in turn are again formed as conveyor tables 18 able to convey in the direction of the arrow A with rollers 19 and belts 20 leading around them. The conveyor tables 18 are installed as a unit in brackets 21 (FIG. 2), which brackets are mounted slidably by means of a guide bush 22 on a vertical support pillar 23. The conveyor tables 18 are consequently raisable and lowerable in the vertical direction.

In the direction of conveyance of the conveyor tables 18 is attached the removal arrangement designated by 11, which consists of conveyor belt sections 24, 25, 26, which convey parallel to the arrow A, and conveyor belt sections 27, 28, 29 which convey at right angles thereto.

The conveyor belt sections 24, 25, 26 are liftable above the plane formed by the conveyor belt sections 27, 28, 29 and lowerable there below, as is the case with the small conveyor belts 15 relating to the rollers 16.

A structure 30 spans the combined conveyor arrangement 14 gantry-wise and is a two-pronged conveyor fork 31 depends therefrom and is mounted for reciprocal movement at right angles to its prongs and parallel to the direction of conveyance of the rollers 16, so that the lower ends of the two prongs describe a straight path running directly above the conveyor surface of the conveyor arrangement 14 during the movement of the conveyor fork 31. The conveyor fork 31 is driven in the same sense and at the same rate together with the delivery fork 17 and serves to push a bundle fed from the small conveyor belts 15 to the rollers 16 over the roller path and consequently to the simultaneously extending delivery fork 17 whereby the latter then transports the bundle to one of the conveyor tables 18.

In the arrangement represented in FIG. 1, the conveyor fork 31 is in the readiness position to push a bundle supplied on the conveyor arrangement 14 in the direction of conveyance (arrow A), to the right on the table 18 appearing nearer in FIG. 1, while the other of the tables 18 remains inoperative.

On the structure 30 are, additionally, two depending stop rods 32 which limit the path of travel of a bundle on the small conveyor belts 15. These stop rods 32 are mounted pivotably

at 33 about a vertical axis, and by means of servomotors 34, indicated diagrammatically, can be swung out from the conveyor path of the small conveyor belts 15 in the event that the cross layer will not be employed in the production line in which case the whole cross layer acts as a transit station.

On the structure 30 is also a photocell 35 which serves, when switched on, to respond to the arrival of a bundle on the conveyor arrangement 14 and consequently to provide a signal for the tripping of the successively adjusted movements of the small conveyor belts 15, of the conveyor fork 31 and of the delivery fork 17.

Numeral 36 in FIG. 1 indicates a case conveniently located at an easy-to-reach position, said case presenting a switchboard and containing all the control units for controlling the course of movements to be described subsequently in the desired succession.

In FIG. 2 the essential elements of the device with the omission of the structure 30 are represented. Therein are diagrammatically shown the turning conveyor 10, the delivery fork 17 arranged in its middle position, the right-hand member of the two tables 18 with its bracket 21, guide bush 22 and support pillar 23. On the table 18 is represented a pile S in the course of formation consisting in the first instance of two cross laid bundles.

As already mentioned, the delivery fork 17 is movable over the table 18 and withdrawable therefrom. For this purpose, the prongs of the delivery fork 17 are mounted on ball bearings 38 (shown only diagrammatically) in a similar manner as a ball bearing-mounted drawer.

In the path of movement of the delivery fork 17 are stop blades 39 retractable from below, which are mounted pivotably at 40 and are retractable or extensible by means of magnets 41. The represented position of the two stop blades 39 corresponds to the extended position. In addition there are fixed on the delivery fork 17 switches 37, shown merely diagrammatically, and responding to pressure, the purpose of which will be explained later.

On the table 18 is seen, rigidly fixed to the bracket 21, a permanent magnet 42 which, during its up and down movement with the table 18, comes within the range of response of magnetic proximity switches 43, 44 and 45, which are fixed on the frame of the device. These proximity switches are designed for determining the two upper limiting positions and also the lower limiting position of the table during normal operation of the device and to provide appropriate control pulses.

In FIG. 2 is also seen a photocell 46 which is designed to determine the height attained of a pile of bundles stacked on the table 18. It is to be noted that the photocell 46 transmits a signal dependent on the height of the pile, while the proximity switches 43-45 transmit a signal depending only on the vertical position of the table 18. FIG. 2 also diagrammatically illustrates the drive for regulating the vertical position of the table 18. This drive includes a motor 47 such as a hydraulic motor, on the driving shaft of which is mounted a winch 48 for a wire 49. The free end of the wire is led over a fixed pulley 50 and secured to the guide bush 22. If the motor 47 is energized then the wire 49 winds on the winch 48 and thus the table 18 rises. If the motor is braked, the table stays still; if the motor is released, then the table 18 lowers as a consequence of its own weight.

Finally, at 51 is indicated a hydraulic pump with associated oil container.

FIG. 3 shows the limiting positions which the tables 18 can assume during normal operation of the device. In FIG. 3 may again be seen the delivery fork 17 and the right and left tables 18 associated therewith. Tables 18 are shown in FIG. 3 in three possible positions viz: an uppermost position (drawn in solid lines on the right and on the left in broken lines) corresponding to the position into which the table is lifted when a finished pile is to be removed, a middle position (shown in solid lines on the left, and broken lines on the right) corresponding to the height of the table before the deposition of the first bundle forming the pile 8; and finally the lowest posi-

tion (shown at the left and right in broken lines) corresponding to the lowest possible position of the tables. The table is lowered to its lowest position in the course of a working stroke of the delivery fork, as explained subsequently.

In FIG. 4 there is represented a detail of a liftable and lowerable conveyor belt. The small conveyor belts 15, 24, 25 and 26 can, for example, be formed in this way. There may be seen in FIG. 4 an endless conveyor belt 52 which is led over a drive roller 53 on a drive shaft 54, and also over a deflection roller 55, the axis 56 of which is mounted displaceably in a slotted guide (not shown in detail) against the action of a spring 57 against the drive shaft. The upper strip of the belt 52 traveling in the direction of the arrow B runs over a slide rail 58 on which are hinged, at 59 and 60, two equal arms 61 and 64 of respective two-armed levers. These two-armed levers are mounted pivotably on fixed axles 62 and 65 and the axles 62, 65 and the hinge points 59 and 60 are at the corners of a parallelogram. The other arms 63 and 66 of the two-armed levers are respectively hinged to draw rods 68 and 71, which, in turn, are articulated to the cores 69 and 72 of magnetic coils 70 and 73.

If the magnetic coil 70 is excited, the rail 58 and consequently the conveyor belt 52 is lifted into the position represented in solid lines whereby at the same time the deflection roller 55 is moved towards the drive roller 53. If, on the other hand, the magnetic coil 73 is excited, then conversely the rail 58 is lowered. It is to be observed that both end positions of the rail are stable positions of equilibrium and consequently the magnetic coils 70 or 73 need to be excited only for reversal, whereby the conveyor belt 52 always remains tensioned. At F is diagrammatically illustrated the height of the conveyor table associated with the raisable and lowerable conveyor belt 52. It can be clearly seen therefore that, although represented in FIG. 4 on increased scale, the conveyor belt 52 in the raised position is capable of conveying, whereas in the lowered position it is ineffective.

The device (cf. FIGS. 1, 2) now operates as follows:

It may be assumed that the bundle 13' (FIG. 1) is at the point of being brought to the conveyor arrangement 14 and that, in addition, the right-hand table 18, as viewed in the direction of conveyance (arrow A, FIG. 1), is ready to stack. The small conveyor belts 15 are in the lifted position and receive the bundle 13' from the turning conveyor 10 and convey it further in the same direction until the photocell 35 senses the arrival of the forward edge of the bundle 13'. At this moment the small conveyor belt 15 is lowered and the conveyor fork 31 begins to push the bundle over the rollers 16. Simultaneously, the delivery fork 17 also begins to extend from below the rollers 16 in the same direction as the fork 31 and receives the bundle at the exit from the rollers 16 and carries it over the table 18. Table 18 is lifted from its lowest position until it attains the level at which the permanent magnet 42 (FIG. 2) comes within the range of response of the switch 44. As soon as the delivery fork 17 has reached its end position, the stop blades 39 swing upwards. The conveyor fork has simultaneously, i.e. as soon as the delivery fork 17 has received the bundle 13, been taken back to its starting position in order, in the meantime, to take over a newly supplied bundle. As soon as the stop blades 39 has swung up, the delivery fork 17 is now withdrawn, whereupon the bundle, held back by the stop blades 39, falls on the table 18. When the delivery fork is withdrawn to its starting position, the table 18 is lowered. Thereby the photocell 46 senses the upper end of the falling bundle and emits a signal which, on the one hand, sets off the repetition of the said process and, on the other hand, stops the lowering movement of the table.

Now the described process is repeated with the difference that a bundle already lies on the table 18, i.e. upon its lifting it can no longer reach the same lifted position at which the permanent magnet 42 comes into the response range of the switch 44. The delivery of the second and the following bundles takes place, on the contrary, as follows. With the extended delivery fork 17 and the bundle still resting thereon,

the stop blades 39 are raised and the table 18 with the bundles already lying thereon reaches a lifted position in which the pile of bundles exerts a definite pressure on the fork 17, it being obvious that fork 17 reaches its extended position before the top of the pile contacts the bottom side of fork 17, this being achieved by any suitable known means such as delay of travel of table 18. Thereby the pile is straightened and compressed from the underside of the extended fork 17 with increasing pressure until one of the pressure switches 37 responds. The response of this switch 37 has an action similar to the response of the magnetic switch 44, namely that of stopping the lifting movement of the table 18 and of starting the withdrawal of the delivery fork 17, whereupon the process continues as previously described and repeats itself until the desired height of the pile is reached, whereupon finally the whole table is lifted into the position represented by a solid line on the right of FIG. 3, and the pile is removed. In the meantime, upon reaching of the desired height of the pile, the whole device is switched over in such a way that the other table 18 is operated.

The desired pile height may be determined either on the basis of the number of bundles for a pile, e.g. by means of a preset counter in the control, or by setting the vertical distance between photocell 46 and proximity switch 43.

Further, within the range of each of the tables 18, can be provided, if desired, an automatic baling equipment (not shown) which bales up the finished piles. Such automatic baling arrangements are known and obtainable in commerce, so that a description thereof is out of place here, the more so as such a baling arrangement is not part of the invention.

I claim:

1. A device for piling up a stack of flat objects comprising: stack support means; first drive means for controllably lifting and lowering said stack support means; means defining a stationary object support and a movable object support, said movable object support having an upper and a lower side and being extendable to and withdrawable from a position overlying said stack support means; said stationary support having an edge extending to and substantially contiguous with said movable object support when said movable object support is in said overlying position; second drive means for controllably moving said movable object support; conveyor means to convey said objects along a path of travel extending across said stationary object support and said movable object support, abutment means to engage said objects on said upper side of said movable object support and to hold said objects in position when said movable object support is being withdrawn

from its overlying position, said first and second drive means and said conveyor means being operable to extend said movable object support to said overlying position, to convey said objects along said path of travel, to lift said stack support means until the stack being formed abuts against and is pressed by said underside of said movable object support, to withdraw said movable object support from said overlying position while the objects are being held in position by said abutment means and upon withdrawal of the movable object support are delivered onto the stack, and to lower said stack support means towards its lowermost position.

2. A device as claimed in claim 1, in which said movable object support is a gridlike structure movable back and forth and guided in a horizontal plane parallel to the plane of the objects, the abutment means including pivotally mounted stops adapted to penetrate into the path of movement of said gridlike structure.

3. A device as claimed in claim 1 comprising means for interrupting the movement of the stack support means towards said lower side of the movable object support upon attainment of a predetermined application pressure between the movable object support and said stack.

4. A device as claimed in claim 1 comprising a second stack support means, said movable object support including a delivery fork arranged for rectilinear movement back and forth from a middle position situated between said two stack support means over one or the other thereof, said abutment means comprising pivotally mounted stops associated with each of the stack support means and being adapted to penetrate into the path of movement of said delivery fork.

5. A device as claimed in claim 4, in which said stops are constituted as abutment rakes with teeth which in operative position engage from below between the teeth of said delivery fork.

6. A device as claimed in claim 1, in which said stack support means includes a conveyor means which can be selectively operated, depending on the height of the pile.

7. A device as claimed in claim 4, in which the stack support means not swept by the delivery fork is liftable to at least the level of the delivery fork, in order to remove the stack deposited on said stack support means in the same plane in which the objects are supplied.

8. A device as claimed in claim 2 comprising a driver associated with said gridlike structure to act on one of the lateral edges of the objects to be supplied and displaceable back and forth in the same direction and at the same rate as said gridlike structure.