April 27, 1965 G. MEYLAN 3,180,638

CONTINUOUS STACK ADVANCING APPARATUS

Filed April 6, 1962 5 Sheets-Sheet 1

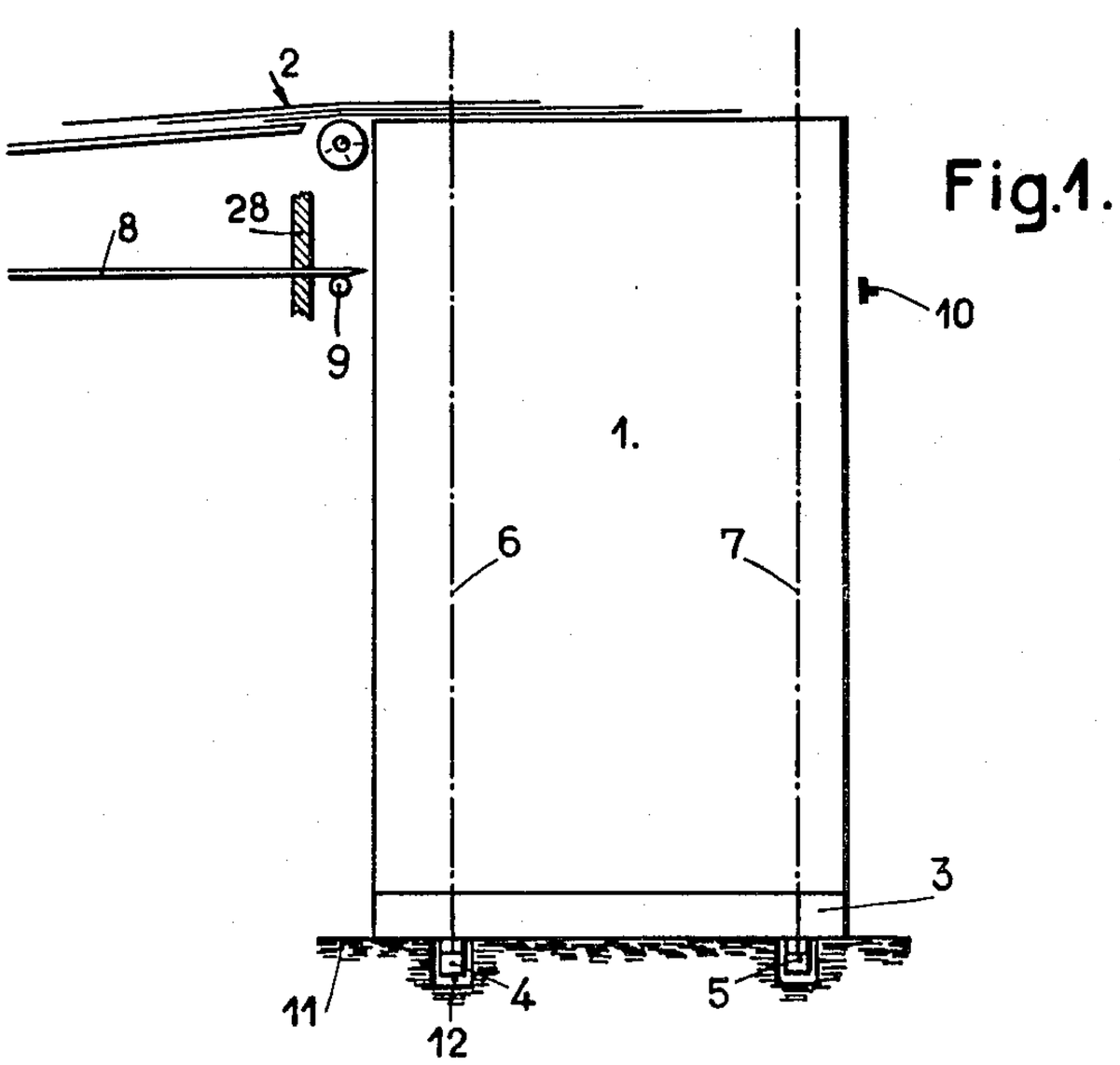


Fig.1.

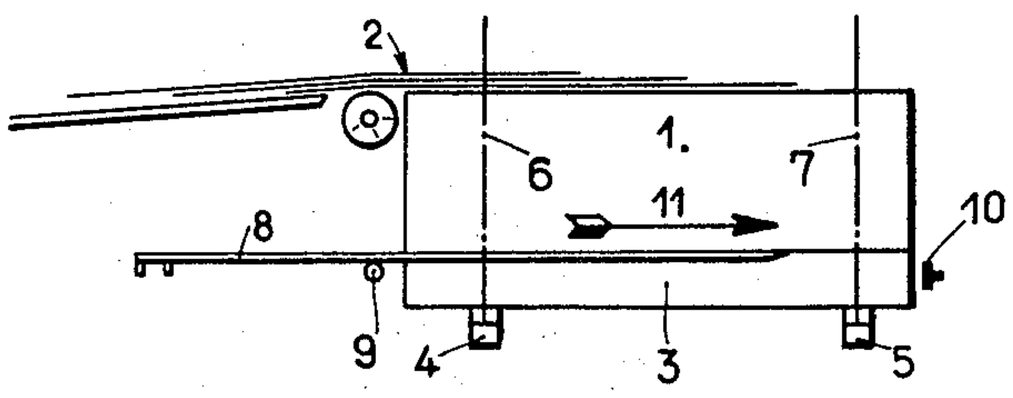
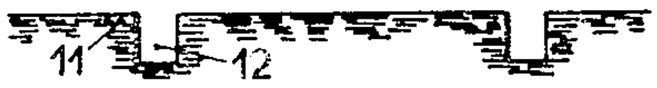


Fig.2.



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CONTINUOUS STACK ADVANCING APPARATUS

Filed April 6, 1962 5 Sheets-Sheet 2

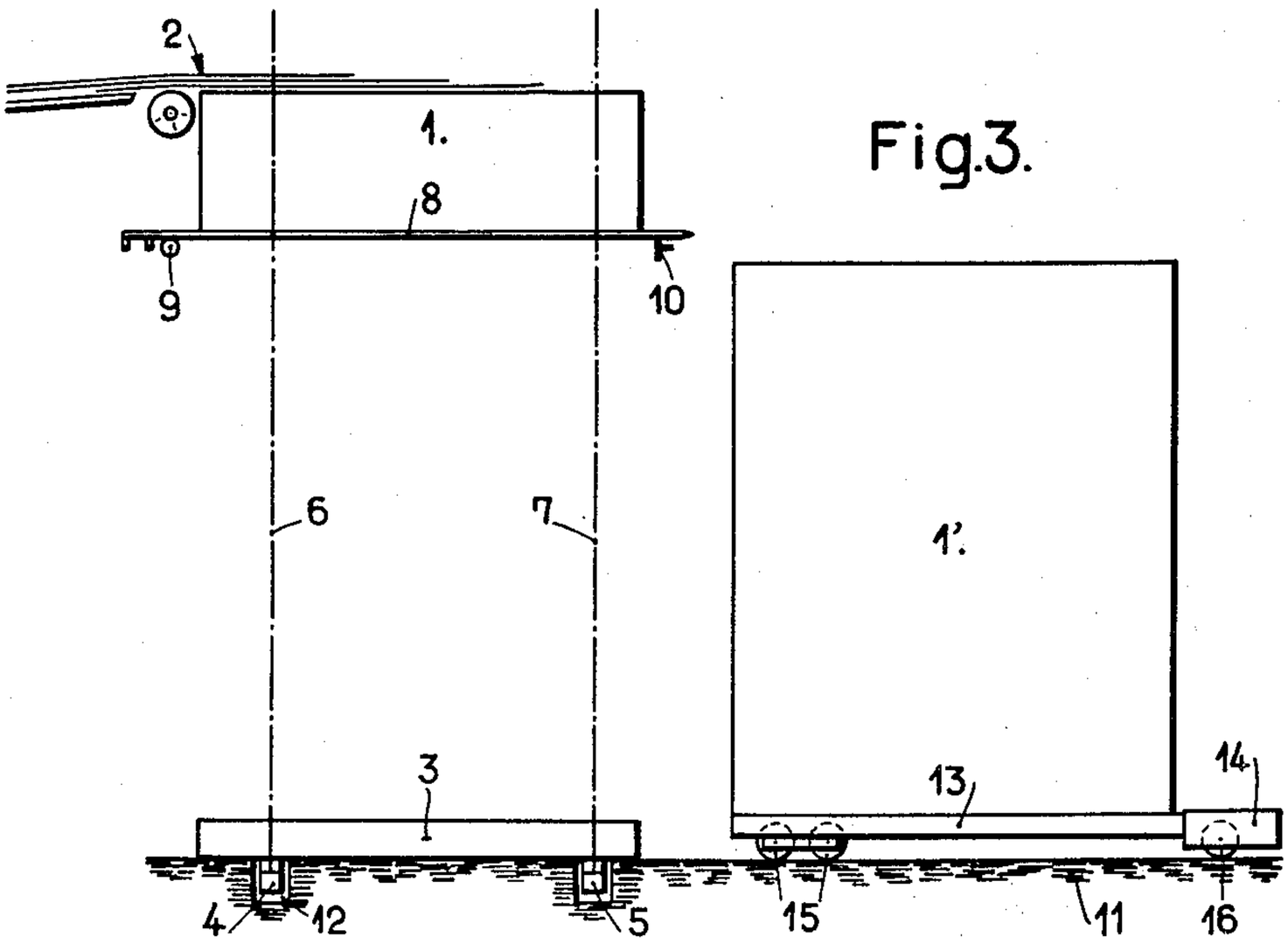

Fig.3.

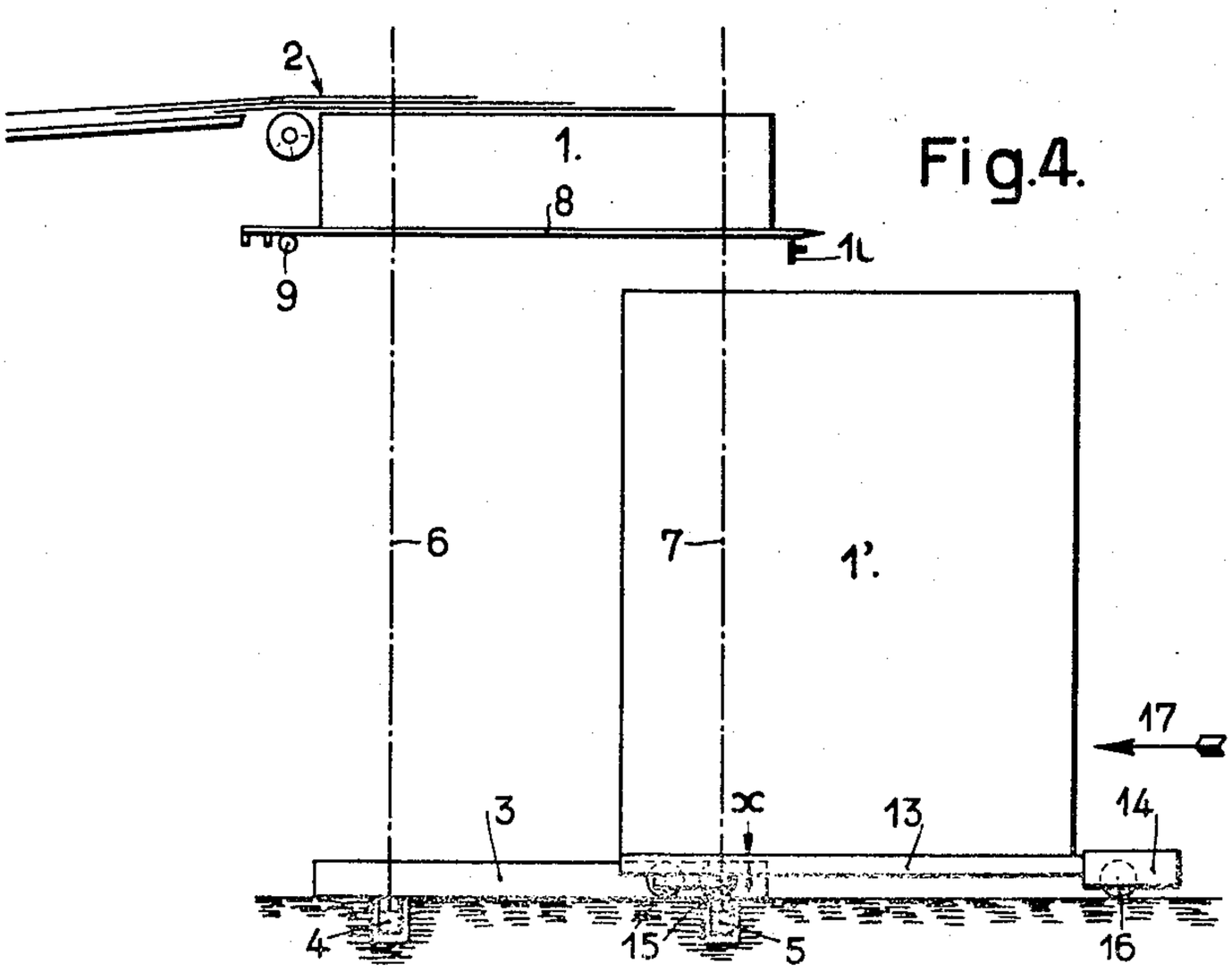

Fig.4.

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CONTINUOUS STACK ADVANCING APPARATUS

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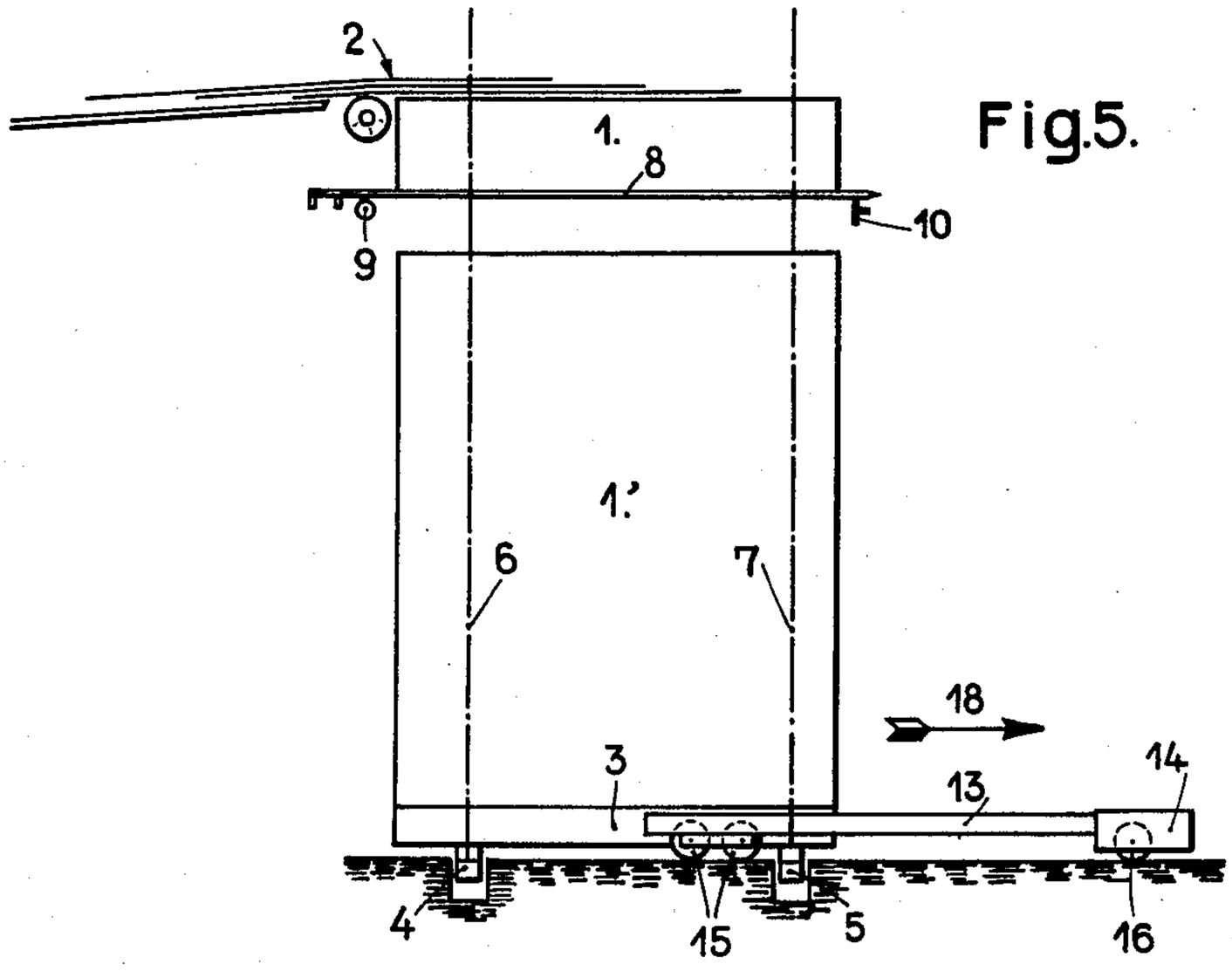

Fig.5.

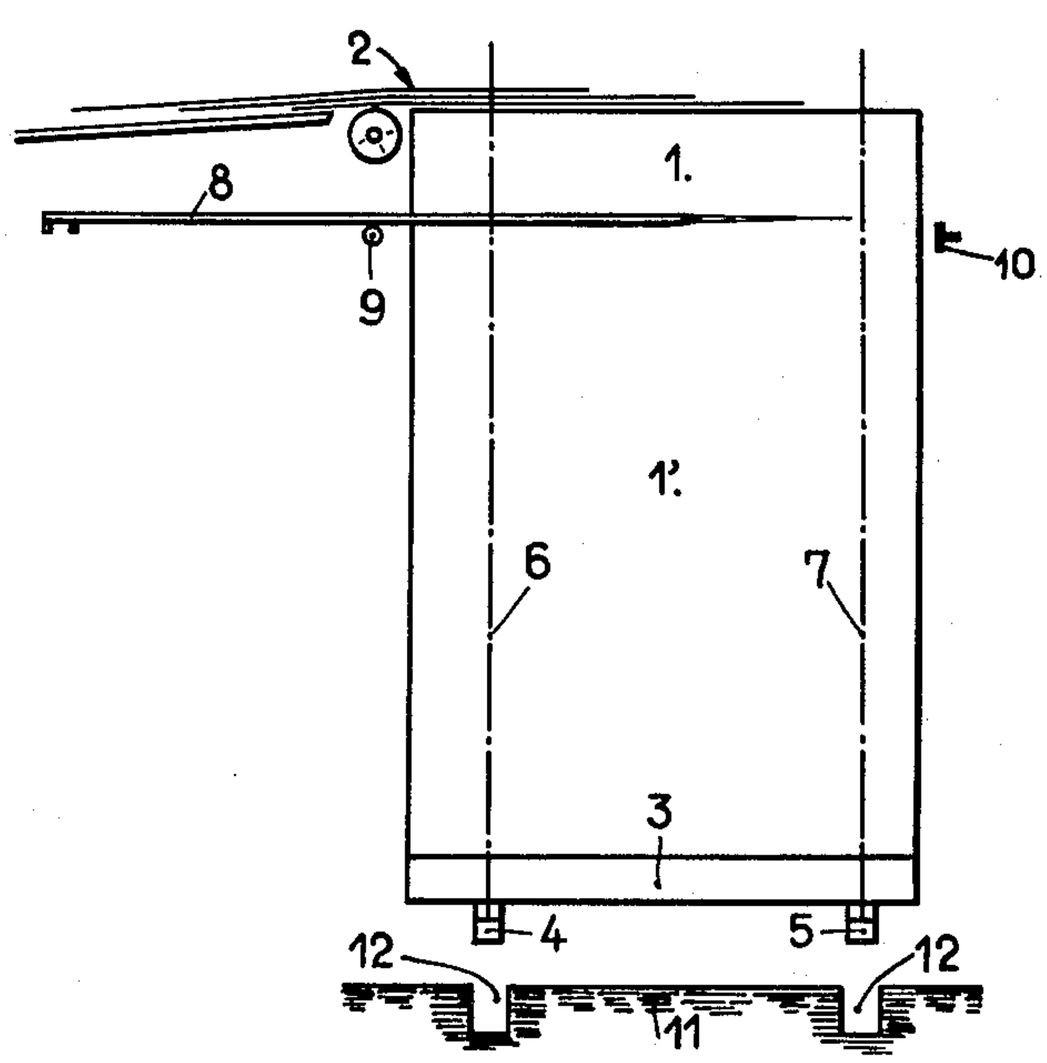

Fig.6.

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CONTINUOUS STACK ADVANCING APPARATUS

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Fig.7.

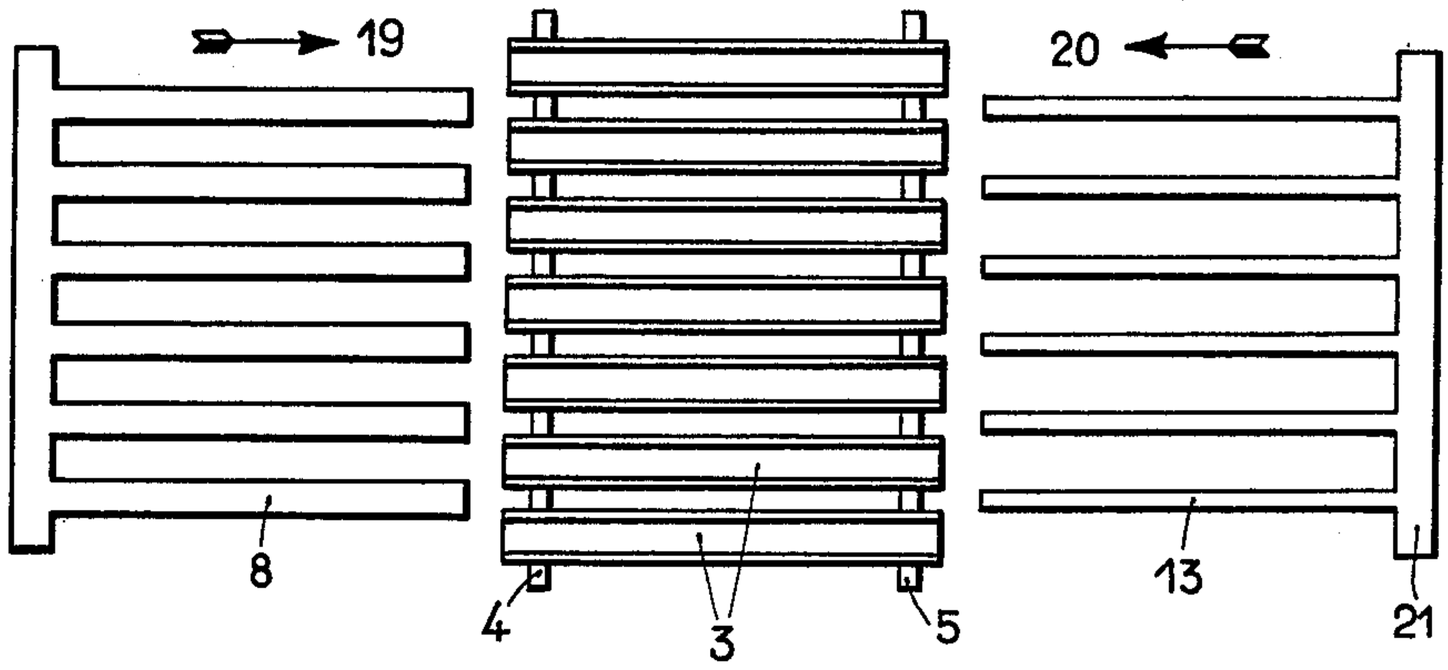
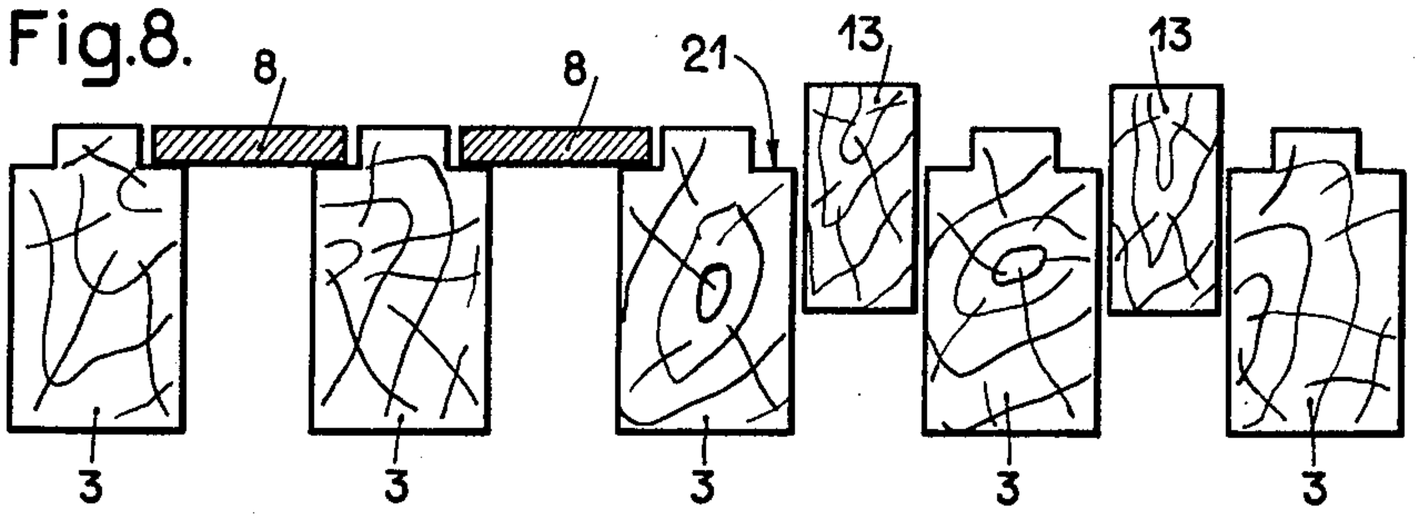


Fig.8.



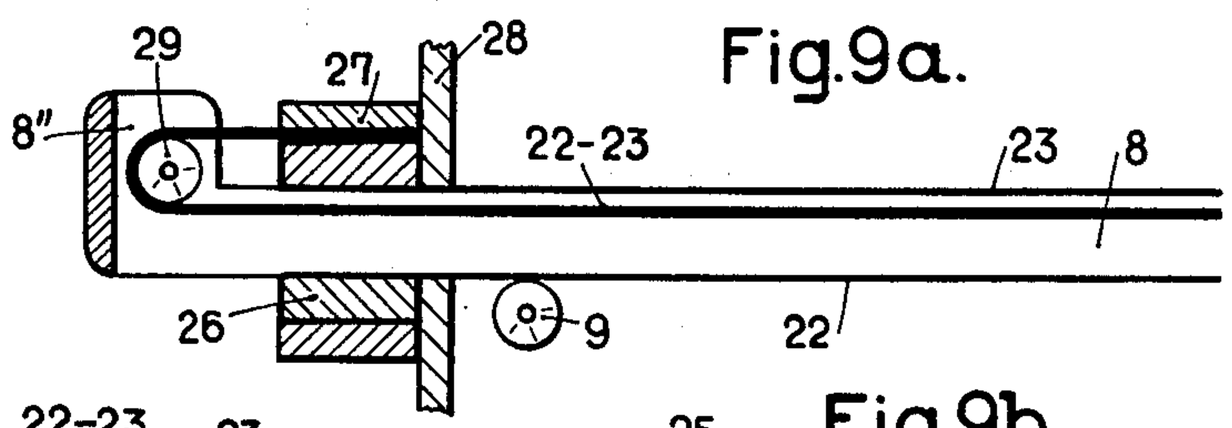


Fig.9a.

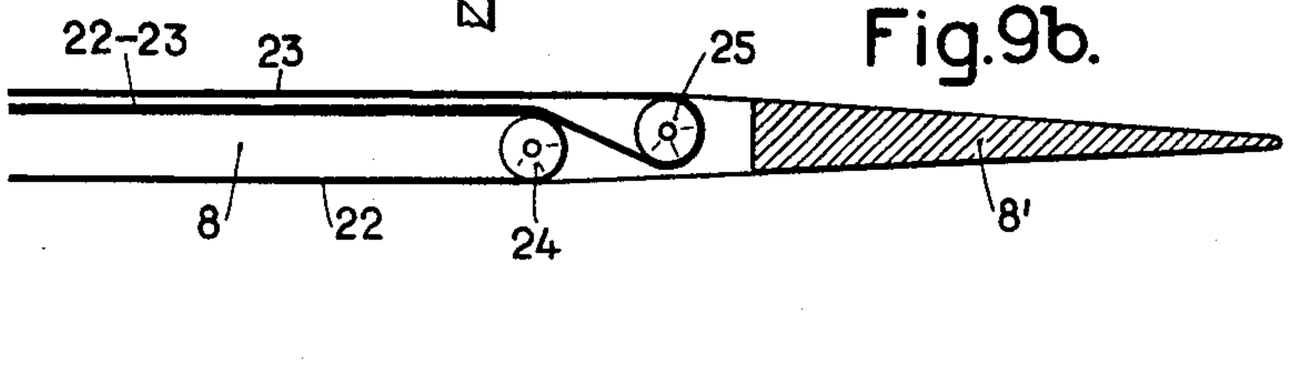


Fig.9b.

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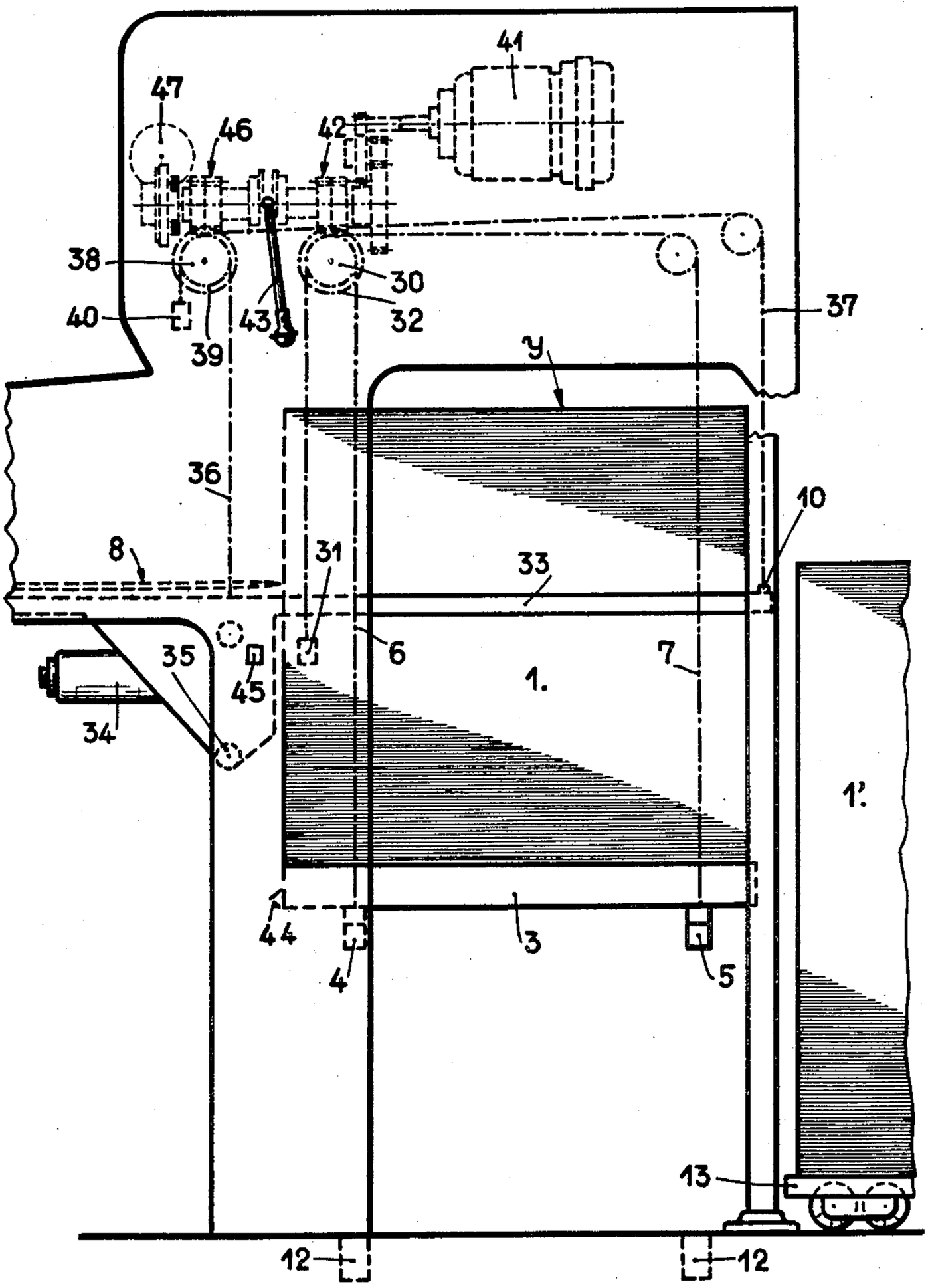
Fig.10.



United States Patent Office

3,180,638
Patented Apr. 27, 1965

3,180,638
CONTINUOUS STOCK ADVANCING APPARATUS

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Filed Apr. 6, 1962, Ser. No. 185,626
Claims priority, application Switzerland, Apr. 17, 1961, 4,533/61
6 Claims. (Cl. 271—62)

This invention relates to devices for continuously feeding sheets.

More particularly, the invention is directed to feeding devices of the type comprising a mechanism for distributing one by one paper or cardboard sheets taken from a pile and wherein the pile is supported by a plate and raised by endless chains so as to maintain practically constant the level of the upper face of the pile, where the sheets are removed one by one. Arrangements have been proposed for allowing the substitution of a fresh pile for a pile being exhausted, without being necessary to interrupt the working of the machine which is supplied by the aforesaid pile.

In particular, it is known to double the plate lifting the pile, with a thin plate capable of supporting a reduced number of sheets, which makes it possible, when this number is reached, to remove the plate, and put in its place a plate loaded with a new pile and, after having effected the junction of the former and the new pile, to withdraw the plate and continue working without interruption.

The present invention pursues the same aim, but with means facilitating the putting in place of each new pile and, moreover, lending itself to a semi-automation of the above mentioned operations.

In accordance with the invention there is provided apparatus for continuously feeding sheets and including a device which feeds sheets one by one from the top of a pile. The apparatus comprises elevator means for supporting a pile of sheets, with the top thereof in operative association with the feed device for having the sheets removed one by one from the pile. The elevator means raises the pile as the latter is being depleted, to always maintain the top of the pile in association with the feed device. The elevator means includes parallel girders defining spaces therebetween and forming a grate. The apparatus further comprises rake means located at a level above the elevator means for being inserted into the pile of sheets as the elevator means reaches the level of the rake means so that the rake means supports the pile independently of the elevator means. In further accordance with the invention, there is provided means for lowering the elevator means with the pile supported on the rake means to the initial position of the elevator means, whereby the latter may be loaded with a fresh pile of sheets. There is further provided means for raising the rake means and the pile supported thereon, to continue feeding of the sheets from the pile by the device. The invention further contemplates the provision of truck means containing a fresh pile of sheets for transferring the latter to the elevator means. The truck means includes spaced girders cooperatively arranged for being inserted into the spaces between the girders of the elevator means at a level slightly thereabove. The elevator means is then lifted to engage and support the fresh pile of sheets and raise the same from the truck means towards and into contact with the rake means which is still raising the original pile of sheets towards the feed device. The rake means is withdrawn as the fresh pile of sheets on the elevator means comes into contact therewith to cause the remainder of the sheets from the first pile to be deposited onto the sheets of the fresh pile. The rake means includes spaced needles having free ends for penetrating into the pile of sheets, and a support for the free ends of the spaced needles adjacent a side of the pile through which the needles penetrate after having been inserted in the pile. The girders of the elevator means have upper surfaces provided with notches and each needle of the rake means has edges which rest in the notches of adjacent girders of the elevator means as the needles are inserted into the pile, whereby the girders of the elevator means support the needles of the rake means as the latter penetrate into the pile. The girders of the elevator means support the needles until the latter are supported at the free ends thereof on said support, after which time the elevator means may be lowered.

In further accordance with the invention, it is contemplated that the rake means includes means for minimizing friction between the sheets of the pile and the needles, as the latter are inserted and withdrawn from the pile.

The attached drawing represents an embodiment of the invention given by way of example, and wherein

FIGS. 1 to 6 are diagrammatic illustrations explaining the working principle of the feeding apparatus of the invention.

FIG. 7 is a diagrammatic plan view, of the elevator, the rake and the truck.

FIG. 8 is a sectional view through the elevator, on an enlarged scale.

FIGS. 9*a* and 9*b* are sections of the two ends of a rake element; and

FIG. 10 is a simplified view in elevation of a sheet feeding device.

The semi-schematic view in elevation of the FIG. 1 shows a pile freshly introduced, in working condition. This pile occupies volume **1** and its sheets leave it by forming a layer **2**, being taken out one by one by means known by themselves which is unnecessary to describe in further detail.

This pile is put on an elevator **3**, formed by rectilinear, parallel supports made up of small girders guided in the direction of the transport of the sheets, i.e. parallel to the plane of the drawing and regularly spaced from each other.

These small girders rest on two cross-bars **4** and **5**, to which they are tied, these cross-bars being in their turn suspended from hoisting chains represented by the dash and dot lines **6** and **7** positioned in pairs in front of and behind the pile.

At a level situated near the upper face of the pile is a rake which is made up of needles **8**, for being displaced horizontally between rollers **9** and a transversal support **10**.

When the elevator formed by small parallel girders **3** occupies its lowest level represented here, it lies practically on the ground **11** and its cross-bars are sunk-in small corresponding pits **12**.

As and when sheets are taken out of the upper face of the pile, the chains **6** and **7** lift the pile and, at a particular position, the elevator **3** reaches the level of the rake **8**. This is the position shown in FIG. 2.

At this moment, it is possible to push the rake in the direction of arrow **11** over the elevator **3**, it being understood that the rake will be placed between the small girders of the elevator, immediately under the pile which they support. The free end of the rake, in its foremost position, rests on the transversal support **10**, and the said rake is capable of supporting the remaining sheets of the pile **1**, while the elevator **3** is being lowered. The feeding device continues working, means of course being provided for lifting the rake during the operation of the subsequent reloading on the elevator **3**.

This latter operation is shown in FIGS. 3 to 5. In FIG. 3, the elevator **3** has been lowered again to the level of

the ground 11, its cross-bars 4 and 5 being sunk in the pits 12.

Behind the aforesaid elevator is a truck 13, supporting a new pile of sheets 1'. It is also made up in the manner of a rake, i.e. of elements of small girders connected together at only one of their ends by a transversal element 14. Rollers 15 and 16, support the entire assembly.

The elements of the truck are arranged and sized in such a way that they pass between the girders of the elevator 3, maintaining the bottom of pile 1' above the level of the girders of elevator 3, this condition being necessary to allow the fresh pile 1' to be placed over the elevator 3.

At this moment, there is thus interpenetration of the small girders of the truck 13 and of those of the elevator 3, the upper level of the latter being slightly under the upper level of the first. FIG. 4 shows the beginning of the introduction of the new pile 1' in the feeding device in direction of the arrow 17. Therein, appears the level difference x between the lower face of the pile brought by the truck 13 and the upper face of the elevator 3. It is also apparent that the height of the remainder of the pile 1 has been reduced, this pile having continued its ascent during the reloading operation above described.

This operation comes to an end once the fresh pile 1' has been put in place and lifted by an amount to lift the pile 3' free of the truck 13 (see FIG. 5) which can then be withdrawn in the direction of arrow 18, but before the lifting of the cross-bars 4 and 5 up to the point of opposing the passage of the rollers 15. It should be noted that these latter are two in number owing to the necessity of making them pass over the pits 12.

Once the truck 13 is completely withdrawn (FIG. 6) a lifting of the fresh pile 1' sufficient to apply the upper face under the rake 8 makes it possible, by withdrawing this latter, to cause the remainder of the pile 1 to rest on the fresh pile 1', the entire operation being effected without having to interrupt the working of the machine fed by the described feeding device.

Once the rake 8 is completely withdrawn, it will of course be lowered to its starting level of the FIG. 1, along with the support 10, allowing thus to repeat the operation already described.

As to the truck 13, it can be reloaded for each operation or, a reserve of various like trucks may be provided. Finally, it is recommended that its rollers 15 and 16 of the truck roll at least partially on rails which guide them.

Viewed in plan, the above described operations are apparent from a consideration of FIG. 7.

On the elevator 3, made up of small girders parallel to each other and regularly spaced, and supported and tied by cross-bars 4 and 5 the pile of sheets is put into operation.

On one side of this elevator is, at a given height, the rake 8, the elements of which are arranged in such a way that the elements of the rake and the girders of the elevator may interpenetrate. The rake is shifted therefore in direction of arrow 19. Opposite the rake and at ground level lies the truck 13 made up in a like manner of spaced girders, so as to allow its interpenetration with the girders of elevator 3 by by displacement in the direction of the arrow 20.

The elevator 3 is lifted by four chains or cables secured to the free ends of the cross-bars 4 and 5. The rake 8 is fed as will be evident from the description hereinafter. The truck 13 rests finally on rollers as described above, in the ratio of one pair at the free end of each of its branches and at least two rollers to support its body 21.

The interpenetrations referred to are stilled better seen by the representation in section, to a greater scale, in the FIG. 8.

Therein, appears in diagrammatic representation, a given number (five) of small girders of the elevator 3. Their upper edges are all notched lengthwise, so as to show a shoulder 21, thus there are always two such shoulders in front of each other. This makes it possible to offer

a momentary free guiding and supporting spaced of the elements of the rake 8, the position of two of these elements being represented in section. Thus, they can be inserted without hindrance under the sheets supported by the elevator.

This figure shows also in section, the position of two elements of the truck 13 at the time of reloading, where the upper level of these latter is above the upper level of the small girders of the elevator.

Finally, FIGS. 9*a* and 9*b*, show semi-diagrammatically, how each element of the rake 8, called above needle, is made, FIG. 9*a* referring to its back end and FIG. 9*b* to its front end, both views being in vertical longitudinal section.

It is desired to avoid any friction between the sheets of the piles and the upper and lower faces of these rake elements, when they are introduced between the said sheets.

To this end, each element 8 leads a lower strap 22 and an upper strap 23, which, starting from the back end of the element, respectively pass over pulleys 24, 25 near the tapered front end 8' and then, come back through the center of the element.

The outer strands of these straps are fixed independently in the respective lashing blocks 26, 27, solid for instance with a guiding wall 28 (see also FIG. 1) of the rake.

The two joined central strands pass together over a pulley 29, integral with the back end 8'' of the element under consideration, before to be lashed to the fixed block 27. It is evident that at the time the element or needle 8 goes forth or back, the straps referred to will be unwound or wound up on and under the sheets between which the element is introduced and from where it is withdrawn. Any friction is thus avoided.

In the simplified view in elevation of the feeding device according to FIG. 10, the sheet pile 1 is supported by the elevator 3, the fresh pile 1' is on the truck 13, the rake 8 being inoperative and being withdrawn from the support 10. The cross-bars of the elevator are shown at 4 and 5 and, at 12 are shown the ground pits designed to accommodate bars 4 and 5 when they occupy their lowest position.

The chains lifting the elevator 3 are shown at 6 and 7, passing over the chain wheels 30, on which counterweights 31 maintain them, the said chain wheels being solid with a cog-wheel 32.

A mechanical connection not represented joins normally the chain wheels 30 to the machine in part illustrated at the left side of this figure and which the feeding apparatus feeds with sheets taken from the pile 1. In this way, a regular and adequate elevation of the said pile by means of the chains 6 and 7 and of the elevator 3 is commensurate with the working of the machine. This is the normal working state of the whole.

The rake 8 and its support 10 are in their turn supported by a frame 33 associated to an individual motor 34 and guided by rollers 35, able to be raised and lowered in the body of the feeding device. Chains 36 and 37 support this assembly. In their turn they pass over chain wheels 38 solid with cog-wheel 39 and are terminated by counterweights 40.

A motor 46 and gearing visible on its left make it possible to drive the cog-wheel 39 and thus raise or lower the rake 8 and the elements on which it depends, in particular the motor 34 which serves to move the rake 8 horizontally forward and backward with a view of introducing it between the sheets of the piles or to withdraw it. In some cases, as it will appear further, the motor 41 and the aforementioned gearing can also operate the cog-wheel 32 and through the latter the hoisting chains 6 and 7.

At the time of the first starting of the feeding device, the pile 1 will have been set into working position by putting it by means of a truck, such as 13, on the elevator 3, which will have then been raised until the upper

sheet is brought up to the upper working level *y* (FIG. 10).

This lifting, independent from the running of the excess of the machine operating the sheets is carried out by the motor 41 through the righthand group of gearing 42 driven by the latter and a coupling incorporated in these latter, either electromagnetic (push-button remote control) or mechanical control subject to the lever 43. It concerns here current solutions which it is not necessary to describe in detail, being it understood that at the time of the driving independent from the cog-wheel, there is dissociation of this latter and the driving members in connection with the main machine.

When running normally, it is the connecting elements not represented between the aforesaid machine and the chain wheels 30 which will operate the regular ascent of the elevator 3.

The elevator 3 supports as it appears in FIG. 10, a stop 44 adapted to contact a switch 45.

This latter switch performs two functions: on the one hand, for driving the motor 34 in order to cause the rake to move forward and to introduce it on the elevator 3 occupying at that moment the required level, and on the other hand to set into operation the left-hand group of gearing with a view of causing the rake 8 (chains 36, 37) to move up momentarily in synchronism with the elevator 3.

When the rake 7 is at the end of its forward movement, the motor 34 stops automatically or stops the automatic ascent of the elevator and brings about its rapid descent, the motor 41 carrying out this operation while the rake 8 continues its ascent.

The reloading of the elevator is operated as previously described and once the upper sheet of the new pile 1' brought into contact with the rake 8, a momentary driving of the motor 34 in the opposite direction of the precedent will bring about its withdrawal.

Once the rake is withdrawn, the remainder of the first pile 1 is supported on the new pile 1', and the rake will finally be lowered to its starting position. This operation is carried out by a special motor 47 and the gearing 46. The end travel stop will be preferably automatic.

It is evident that any means can be provided for preventing wrong handlings, excessive ascent of the pile, and for ensuring the automation of all or part of the described operations. This includes mechanical and electrical safety and locking devices easily constructed by one skilled in the art, which do not require a detailed description and which are optional and moreover irrelevant to the object of the properly so-called invention.

In the described and represented example, the reloading piles are brought to the feeding device and introduced in this latter in the gripping and conveying direction of the sheets, but it is clear that the introduction could also be done laterally, for instance.

What I claim is:

1. Apparatus for continuously feeding sheets wherein a device feeds sheets one by one from the top of a pile, said apparatus comprising elevator means for supporting a pile of sheets with the top thereof in operative association with said device for having the sheets removed one by one from said pile, said elevator means raising the pile as the latter is being displaced to always maintain the top of the pile in association with said device, said elevator means including parallel girders defining spaces therebetween and forming a grate, rake means located at a level above the elevator means for being inserted into said pile of sheets as the elevator means reaches the level of said rake means so that the latter supports the pile independently of the elevator means, means for lowering the elevator means, with the pile supported on the rake means, to the initial position of the elevator means whereby the latter may be loaded with a fresh pile of sheets, means for raising the rake means and the pile supported thereon to continue feeding of the sheets from the pile by said device, truck means containing a fresh pile of sheets for transferring the latter to the elevator means, said truck means including spaced girders cooperatively arranged for being inserted into the spaces between the girders of the elevator means at a level slightly thereabove, said elevator means being lifted to engage and support the fresh pile of sheets and raise the same from said truck means towards and into contact with said rake means which is still raising the first said pile towards said device, said rake means being withdrawn as said fresh pile of sheets on the elevator means comes into contact therewith to cause the remainder of the sheets from the first pile to be deposited onto the sheets of the fresh pile, said rake means including spaced needles having free ends for penetrating into a pile of sheets, a support for the free ends of the spaced needles adjacent a side of the pile through which the needles penetrate after having been inserted in the pile, said girders of said elevator means having upper surfaces provided with notches, each needle of the rake means having edges resting in the notches of adjacent girders of the elevator means as said needles are inserted into said pile whereby said girders of said elevator means support the needles of the rake means as the latter penetrate into said pile, said girders of the elevator means supporting said needles until the latter are supported at the free ends thereof on said support after which time the elevator means may be lowered, said rake means including means for minimizing friction between sheets of the pile and the needles as the latter are inserted and withdrawn from the pile, said means including movable straps in part defining a surface for said needles.

2. Apparatus as claimed in claim 1 wherein said needles of the rake means have an upper surface which is flush with the upper surface of the girders of the elevator means with the needles supported in the notches of the latter girders.

3. Apparatus as claimed in claim 1 comprising pulleys within said needles and engaging said straps to cause the latter to move as said needles are moved relative to said pile of sheets.

4. Apparatus for continuously feeding sheets wherein a device feeds sheets one by one from the top of a pile, said apparatus comprising elevator means for supporting a pile of sheets with the top thereof in operative association with said device for having the sheets removed one by one from said pile, said elevator means raising the pile as the latter is being depleted to always maintain the top of the pile in association with said device, said elevator means including parallel girders defining spaces therebetween and forming a grate, rake means located at a level above the elevator means for being inserted into said pile of sheets as the elevator means reaches the level of said rake means so that the latter supports the pile independently of the elevator means, means for lowering the elevator means, with the pile supported on the rake means, to the initial position of the elevator means whereby the latter may be loaded with a fresh pile of sheets, means for raising the rake means and the pile supported thereon to continue feeding of the sheets from the pile by said device, truck means containing a fresh pile of sheets for transferring the latter to the elevator means, said truck means including spaced girders cooperatively arranged for being inserted into the spaces between the girders of the elevator means at a level slightly thereabove, said elevator means being lifted to engage and support the fresh pile of sheets and raise the same from said truck means towards and into contact with said rake means which is still raising the first said pile towards said device, said rake means being withdrawn as said fresh pile of sheets on the elevator means comes into contact therewith to cause the remainder of the sheets from the first pile to be deposited onto the sheets of the fresh pile, said rake means including spaced needles having free ends for penetrating into a pile of sheets, a support for the

free ends of the spaced needles adjacent a side of the pile through which the needles penetrate after having been inserted in the pile, said girders of said elevator means having upper surfaces provided with notches, each needle of the rake means having edges resting in the notches of adjacent girders of the elevator means as said needles are inserted into said pile whereby said girders of said elevator means support the needles of the rake means as the latter penetrate into said pile, said girders of the elevator means supporting said needles until the latter are supported at the free ends thereof on said support after which time the elevator means may be lowered, each said needle having a supported end opposite said free end, a pulley in each said needle at the supported end thereof, a pair of pulleys in each said needle near said free end, said movable straps including a pair of joined movable straps having one end secured, said joined straps passing around the pulley at said supported end, the straps extending to the other pulleys, each strap passing around one thereof and being secured at a location near that at which the joined straps are secured.

5. Apparatus for continuously feeding sheets wherein a device feeds sheets one by one from the top of a pile, said apparatus comprising elevator means for supporting a pile of sheets with the top thereof in operative association with said device for having the sheets removed one by one from said pile, said elevator means raising the pile as the latter is being depleted to always maintain the top of the pile in association with said device, said elevator means including parallel girders defining spaces therebetween and forming a grate, rake means located at a level above the elevator means for being inserted into said pile of sheets as the elevator means reaches the level of said rake means so that the latter supports the pile independently of the elevator means, means for lowering the elevator means, with the pile supported on the rake means, to the initial position of the elevator means whereby the latter may be loaded with a fresh pile of sheets, means for raising the rake means and the pile supported thereon to continue feeding of the sheets from the pile by said device, truck means containing a fresh pile of sheets for transferring the latter to the elevator means, said truck means including spaced girders cooperatively arranged for being inserted into the spaces between the girders of the elevator means at a level slightly thereabove, said elevator means being lifted to engage and support the fresh pile of sheets and raise the same from said truck means towards and into contact with said rake means which is still raising the first said pile towards said device, said rake means being withdrawn as said fresh pile of sheets on the elevator means comes into contact therewith to cause the remainder of the sheets from the first pile to be deposited onto the sheets of the fresh pile, said rake means including spaced needles having free ends penetrating into the pile of sheets, a support for the free ends of the spaced needles adjacent a side of the pile through which the needles penetrate after having been inserted in the pile, said girders of said elevator means having upper surfaces provided with notches, each needle of the rake means having edges resting in the notches of adjacent girders of the elevator means as said needles are inserted into said pile whereby said girders of said elevator means support the needles of the rake means as the latter penetrate into said pile, said girders of the elevator means supporting said needles until the latter are supported at the free ends thereof on said support after which time the elevator means may be lowered, the apparatus further comprising straps in part constituting surfaces for each said needle and means for moving said straps at said surface in a direction opposite to that which the needles are moved when the latter are inserted and are withdrawn from the said pile of sheets to reduce the relative speed between the sheets of the pile and the surfaces of the needles.

6. Apparatus as claimed in claim 5 comprising a frame supporting said rake means adapted for being raised and lowered, said frame including said support for said free ends of the spaced needles.

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