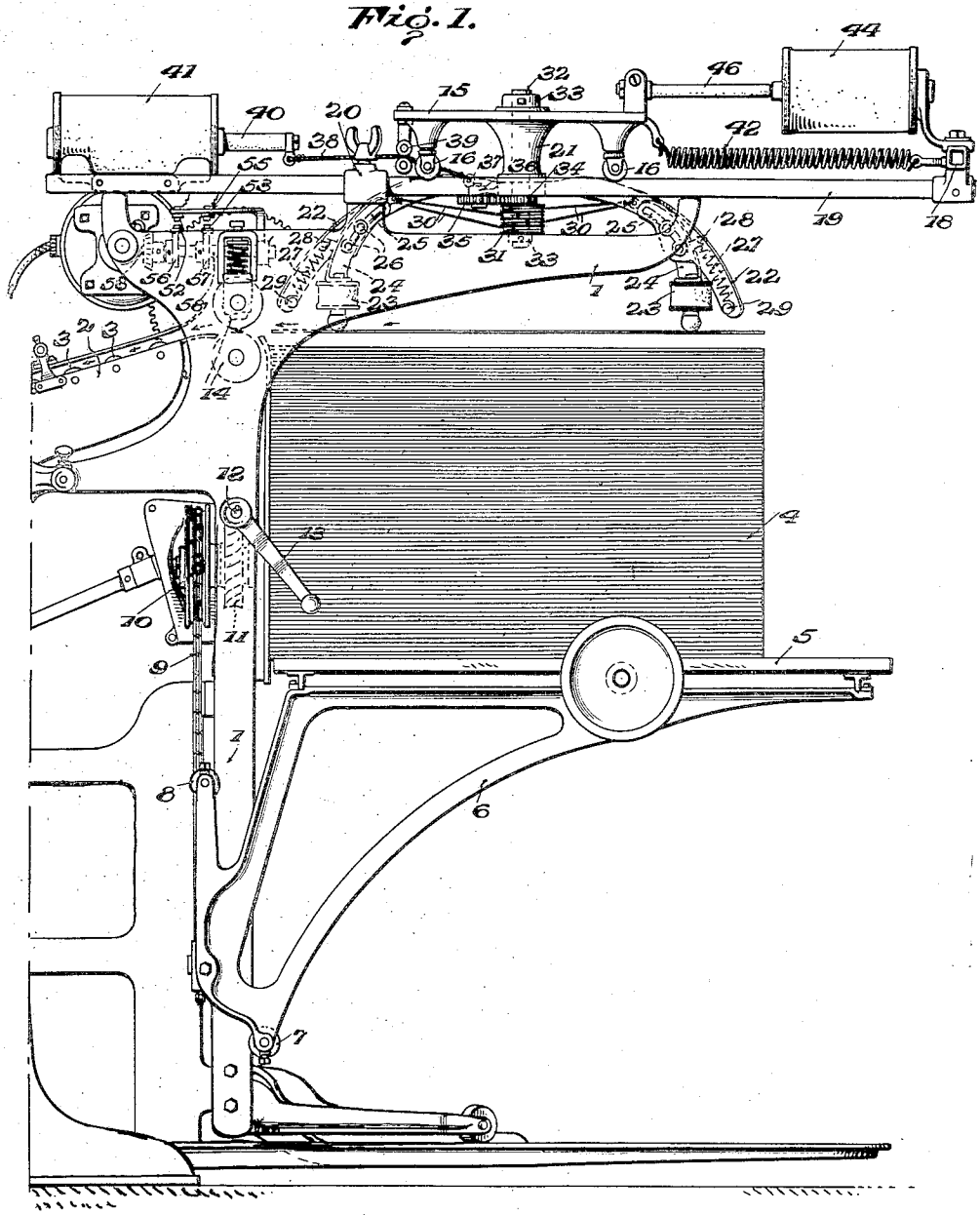
Aug. 9, 1932. E. S. LINCOLN 1,870,339

SHEET FEEDING APPARATUS

Filed June 11, 1930 2 Sheets-Sheet 1

Fig. 1.



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SHEET FEEDING APPARATUS

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Fig. 2.

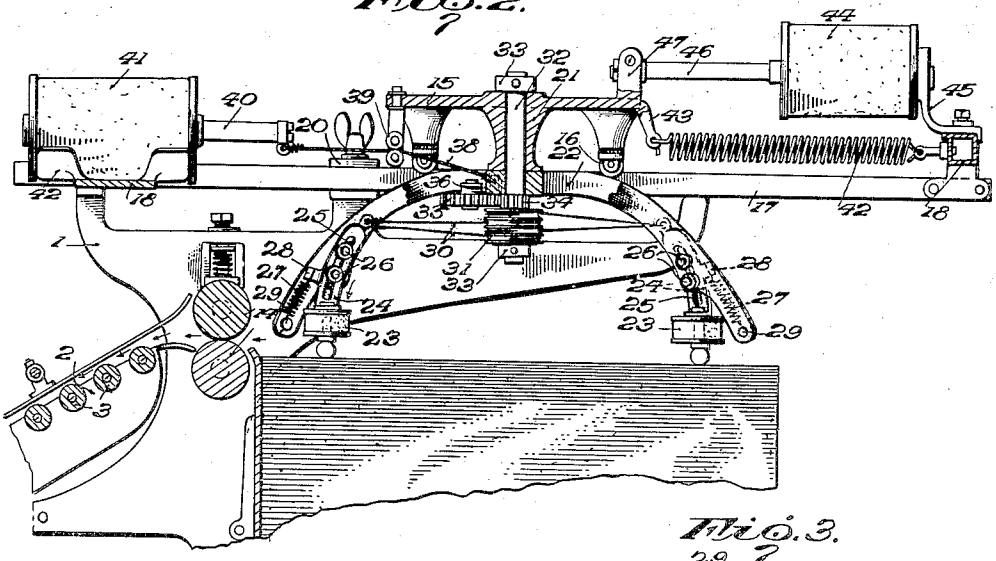


Fig. 3.

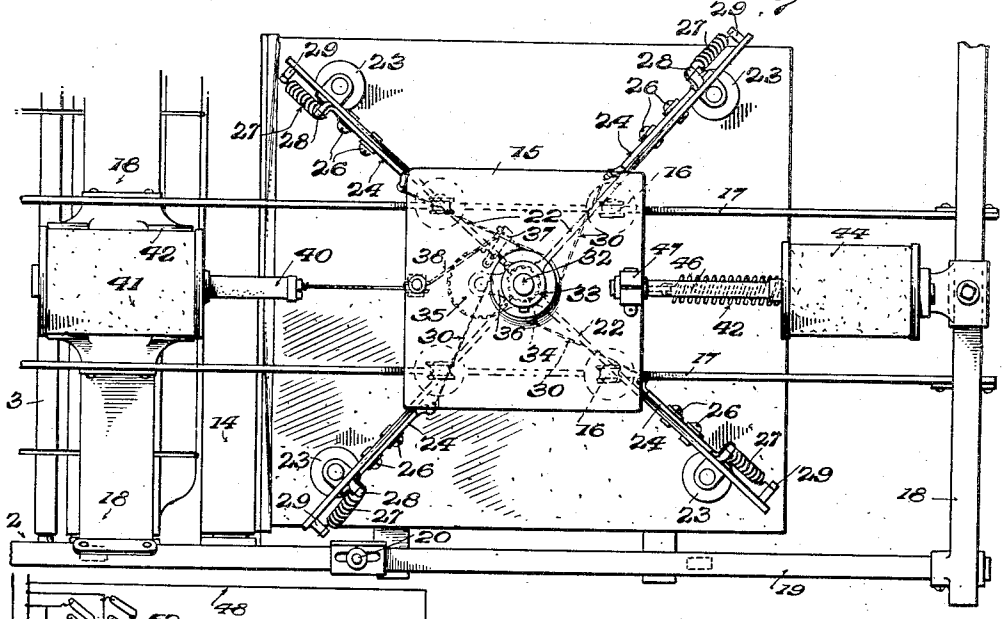
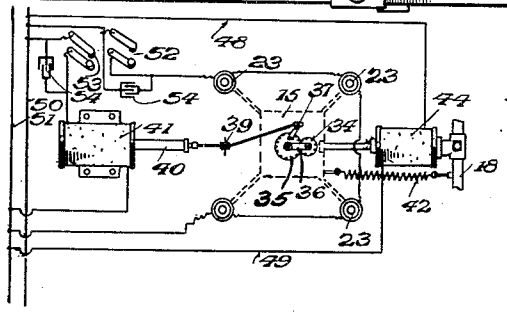


Fig. 4.



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UNITED STATES PATENT OFFICE

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SHEET FEEDING APPARATUS

Application filed June 11, 1930. Serial No. 460,530.

This invention relates to means for separating and lifting sheets one by one from a stack of sheets.

One of the objects of the present invention is to provide novel magnetic means capable of reliably separating and lifting sheets of magnetic material from a stack of sheets.

A further object is to provide novel operating means for one or more sheet engaging means that are adapted to separate and lift the top sheet from a stack.

Other objects will appear more fully hereinafter.

One embodiment of the invention has been illustrated in the accompanying drawings, but it is to be expressly understood that said drawings are for purposes of illustration only, and are not to be construed as a definition of the limits of the invention, reference being had to the appended claims for this purpose.

In said drawings—

Fig. 1 is a side elevation of an apparatus embodying the invention;

Fig. 2 is an enlarged sectional view of the apparatus shown in Fig. 1;

Fig. 3 is a plan view of said apparatus; and

Fig. 4 is a wiring diagram.

While the separating and feeding mechanism constituting the invention is broadly adapted for and may be employed in the separation and feeding of sheets for any purpose, the drawings show the invention embodied in an apparatus for separating and feeding sheets of magnetic material, such as tin, from a stack of sheets to a feed or conveying table. Accordingly, a supporting frame 1, on which the separating and feeding mechanism is mounted, is associated with a feed or conveying table 2 provided with suitable rollers 3. A stack of sheets 4 rests on a table 5 that is supported on brackets 6, one at each side of the machine, said brackets being connected together by suitable transverse members (not shown). Rollers 7 and 8 carried by said brackets provide sliding engagement between the same and the frame 1 to facilitate the raising and lowering of the table 5. A chain 9, secured in any suitable manner to the brackets 6, passes around a spool 10 which may be rotated to elevate the table in any suitable manner. As shown, the shaft of the spool 10 carries a worm gear 11 engaging a suitable worm on a shaft 12 that is driven from a suitable source of power (not shown) and a handle 13 is provided for manual adjustment of the table 5. It is to be understood, however, that the above described pile elevating mechanism is shown for purposes of illustration only and constitutes no part per se of the present invention.

Suitable means are provided for separating and lifting the top sheet from the pile and forwarding the lifted sheet to a pair of rotating feed rolls 14 driven in any suitable manner which forwards the sheet to the table 2. When the sheets are of magnetic material, a plurality of lifting magnets are preferably employed, said magnets being carried by a common support and being movable relative to the support to lift the sheet, whereupon the support is forwarded to feed the sheet off the pile, and preferably a common operating means is employed to lift the magnets relative to the support and to forward the support. In the form shown, the supporting means is constituted by a plate 15 that is provided with rollers 16 engaging rails 17 extending over the top of the pile and supported in any suitable manner as by means of cross members 18 carried by side rods 19 that are adjustable at 20 in the frame 1. Support 15 is provided with a central depending boss 21 to which are secured in any suitable manner a plurality of radially extending arms 22, preferably four in number, that curve downwardly toward the top of the pile at their outer ends and carry lifting magnets 23. In order to elevate the lifting magnets 23 relative to the support 15, each magnet is preferably carried by a curved bracket 24 that is provided with a longitudinally extending slot 25 in which engage pins or bolts 26 secured to the arms 22. Brackets 24 are slidable on the bolts 26 whereby the magnet may be lifted, but are normally held down with magnets 23 in engagement with the top sheet of the stack by suitable resilient means such as coil springs 27 extending from lugs 28 on the brackets 24 to lugs 29 on the lower ends of arms 22. Brackets 24 may be moved

against the tension of springs 27 to elevate the magnets 23 by means of cables 30 passing around and suitably secured to a rotatable drum 31 secured to a short shaft 32 that passes rotatably through the boss 21 of the support 15 and is provided at each of its upper and lower ends with a suitable collar 33.

Preferably drum 31 is rotated by the same means which forwards the support 15 after the magnets 23 have been elevated to feed the sheet off the pile. In the form shown, a pinion 34 secured to the shaft 32 connects with a pinion 35 carried by an arm 36 that is integral with or secured in any suitable manner to the arms 22. A radially extending arm 37 secured to pinion 35 has connected to its outer end a cable 38 that passes between a pair of pivotally mounted pulleys 39 and is connected to the plunger 40 of a solenoid 41 mounted in a cradle 42 secured to the cross member 18. When the solenoid is energized, plunger 40 is drawn into the coil and cable 38 and arm 37 rotate the gears 34, 35, to wind up the cables 30 on drum 31 and elevate the lifting magnets 23 and with them the top sheet of the pile. As soon as the lifting magnets have been fully lifted so that the bolts 26 engage the ends of slot 25, drum 31 and pinions 34, 35 cannot rotate and further movement of plunger 40 pulls the support 15 bodily forward, the rollers 16 rolling on rails 17 until the front edge of the lifted sheet is fed between the rollers 14.

Any suitable means may be provided for holding the support 15 against forward movement until the lifting magnets have been elevated, said means being either resilient or magnetic and being sufficiently powerful to hold the support against forward movement while the magnets are being elevated, but releasing said support as soon as this has been accomplished. In the form shown, a combination of resilient and magnetic means is employed for this purpose, and accordingly a spring 42 connects an arm 43 secured to the support 15 with the rear cross member 18, said spring opposing forward movement of the support 15 and also serving to return said support to its normal position over the top of the pile as soon as solenoid 41 is deenergized. Likewise, a magnet 44, mounted by means of a bracket 45 on the rear cross member 18, attracts an armature 46 secured to a bracket 47 carried by the support 15. The combined tension of spring 42 and holding power of magnet 44 are greater than the total resistance to lifting of magnets 23 so that forward movement of support 15 is prevented while magnets 23 are being elevated to lift the top sheet from the pile, but are insufficient to prevent forward movement of the support when the magnets have been fully elevated and the entire strength of magnet 41 is available to pull the support bodily forward. At this time armature 46 is pulled away from magnet 44 and the support is moved forwardly against the tension of spring 42 thereby forwarding the sheet as above described, until magnet 41 is deenergized whereupon spring 42 pulls the support back to the position shown in the drawings and armature 46 again engages the magnet 44.

It will be understood that any suitable arrangement of circuits for operating the various magnets may be employed. As shown in Fig. 4, three circuits are provided. Wires 48 and 49 connect the electromagnet 44 with mains 50 and 51 respectively, whereby said magnet is constantly energized. The four lifting magnets 23 are connected in series in a circuit between the mains 50 and 51, said circuit including a pair of make and break contacts 52 of any suitable type. Solenoid 41 is likewise connected across mains 50 and 51 in a circuit including a pair of suitable make and break contacts 53, the contacts 52 and 53 being preferably shunted by suitable condensers 54 to prevent arcing. The make and break contacts may be operated in any suitable manner, and as seen in Fig. 1 the upper contact of each pair is secured to an arm 55 and the lower contact of each pair is secured to the frame 1 and is adapted to be bent up into engagement with the upper contact at timed instants by suitable means such as cams 56, 57 on a rotating shaft 58 that is driven from any suitable source of power.

The operation of the apparatus will be understood from the foregoing description. Assuming a pile of sheets on the table 5 and the support 15 held in the normal position shown in the drawings by means of spring 42 and magnet 44, the lifting magnets 23 are resiliently held in contact with the top sheet of the pile by means of springs 27. Rotation of shaft 58 causes cam 56 to close contacts 52, thereby energizing lifting magnets 23 and attracting the top sheet of the pile to said magnets. Substantially simultaneously or shortly thereafter, cam 57 closes contacts 53, thereby energizing solenoid 41. As plunger 40 is drawn into the solenoid, drum 31 is first rotated to wind up cables 30 and elevate the lifting magnets 23 together with the top sheet to the position shown in Fig. 1. As soon as the lifting magnets are fully elevated, the entire strength of solenoid 41 is available to forward the support 15 bodily and the strength of the solenoid is sufficient to overcome the combined action of spring 42 and magnet 44 so that support 15 is pulled forwardly and the raised sheet is fed off the pile. As the sheet is engaged and fed forwardly by rollers 14, cam 56 allows contacts 52 to open thereby deenergizing the lifting magnet and shortly thereafter cam 57 allows contact 53 to open deenergizing solenoid 41, whereupon spring 42 pulls support 15 backward until armature 46 engages electromag-

net 44, and at the same time springs 27 pull the magnets 23 down into engagement with the top sheet of the pile. The operation is then repeated as above described.

The above apparatus provides a sheet separating and feeding mechanism which is greatly simplified in mechanical construction and operation and is very economical to manufacture. A common operating means such as magnet 41 serves both to elevate the sheet lifters relative to the support and then to move the support and lifters bodily forward to feed the sheet off the pile and the support is then automatically returned to its initial position, so that the entire operation is automatic and the individual sheets can be separated and fed from the pile one by one at a rapid rate. It is to be understood, however, that the embodiment described and illustrated in the drawings is for purposes of illustration only, and that changes may be made in the form, details, and arrangement of the parts without departing from the spirit of the invention. Likewise, many of the individual elements may be replaced by different but equivalent elements. For example, other forms of lifting magnets may be employed, or in some cases pneumatic lifters may be more desirable, or the main operating solenoid may be replaced by any equivalent mechanical movement, etc. Reference is therefore to be had to the appended claims for a definition of the limits of the invention.

What is claimed is:—

1. In apparatus of the class described, the combination of a horizontally movable support and a plurality of lifting magnets carried thereby and vertically movable relative thereto, and a common operating means for lifting said magnets relative to said support and for thereafter moving said support and the magnets horizontally.

2. In apparatus of the class described, the combination of a movable support, a plurality of sheet lifting means carried thereby and movable with respect thereto, an operating magnet, and means operatively connecting said magnet with said support and said lifting means to lift the latter with respect to said support and to move said support.

3. In apparatus of the class described, the combination of a movable support, sheet lifting means carried thereby, means normally maintaining said support against movement and effective to hold the same stationary during the lifting operation of the lifting means, and common means for moving said lifting means relative to said support and for thereafter moving said support against the action of said second named means.

4. In apparatus of the class described, the combination of a movable support, sheet lifting means carried by said support and movable with respect thereto, a common operating means for first raising said lifting means with respect to said support and thereafter moving said support, and combined mechanical and magnetic means for holding said support against movement while said lifting means are being raised.

5. In apparatus of the class described, the combination of a movable support, sheet lifting means carried by said support and having a limited range of movement with respect thereto, a stationary operating means operatively connected to said lifting means to move the same through said range of movement relative to said support, and means operatively connected to said support and restraining the same against movement, said restraining means being of less strength than said operating means.

6. In apparatus of the class described, the combination of a movable support, sheet lifting means carried by said support and having a limited range of movement with respect thereto, a magnet operatively connected to said lifting means to move the same relative to said support through said range of movement and then to move said support, and means for returning said support to initial position.

7. In apparatus of the class described, the combination of a movable support, sheet lifting means carried by said support and having a limited range of movement with respect thereto, a stationary operating magnet operatively connected to said lifting means to move the same through said range of movement relative to said support, and resilient means normally maintaining said support against movement, the tension of said resilient means being less than the strength of said operating magnet.

8. In apparatus of the class described, the combination of a movable support, sheet lifting means carried by said support and having a limited range of movement with respect thereto, a stationary operating magnet operatively connected to said lifting means to move the same relative to said support through said range of movement, and a holding magnet operatively connected to said support to restrain the same against movement, said holding magnet being of less strength than said operating magnet.

9. In apparatus of the class described, the combination of a movable support, sheet lifting means carried by said support and having a limited range of movement with respect thereto, resilient means resisting movement of said lifting means, operating means operatively connected to said lifting means to move the same relative to said support through said range of movement, and means restraining said support against movement, said restraining means being of less strength than said operating means but of greater strength than said resilient means.

10. In apparatus of the class described, a movable support, a plurality of sheet lifting means movably carried thereby, a rotatable drum carried by said support, means including cables secured to said drum for elevating said lifting means, and means for forwarding said support.

11. In apparatus of the class described, a movable support, a plurality of sheet lifting means movably carried thereby, a rotatable drum carried by said support, cables secured to said drum for elevating said lifting means, and a common means for rotating said drum and forwarding said support.

12. In apparatus of the class described, a movable support, a plurality of sheet lifting means movably carried by said support, a rotatable drum on said support, cables connecting said drum and lifting means, a common means for rotating said drum and moving said support and means for holding said support against movement while said drum is being rotated.

13. In apparatus of the class described, a movable support, a plurality of sheet lifting means movably carried by said support, a rotatable drum on said support, cables connecting said drum and lifting means, a cable secured to said drum for rotating the same, stationary means connected to said last named cable to rotate said drum and move said support, and means for holding said support against movement while said drum is rotating.

14. In apparatus of the class described, a movable support, a plurality of sheet lifting means movably carried thereby, resilient means maintaining said lifting means against movement, a rotatable drum on said support, cables connecting said drum and lifting means to elevate the latter against the tension of said resilient means, a cable connected to said drum for rotating the same, a stationary magnet for pulling said last named cable, and means for holding said support against movement, said means being of greater strength than said resilient means but of less strength than said magnet.

15. In apparatus of the class described, a movable support, magnetic sheet engaging means carried by and movable relative to the support, and means for moving the magnetic sheet engaging means relative to the support and for moving the latter and said magnetic sheet engaging means together as a unit.

In testimony whereof I have signed this specification.

EDWIN S. LINCOLN.