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3,140,088

SHEET FEEDING OR DISCHARGING MECHANISMS

Filed June 8, 1962

3 Sheets-Sheet 1

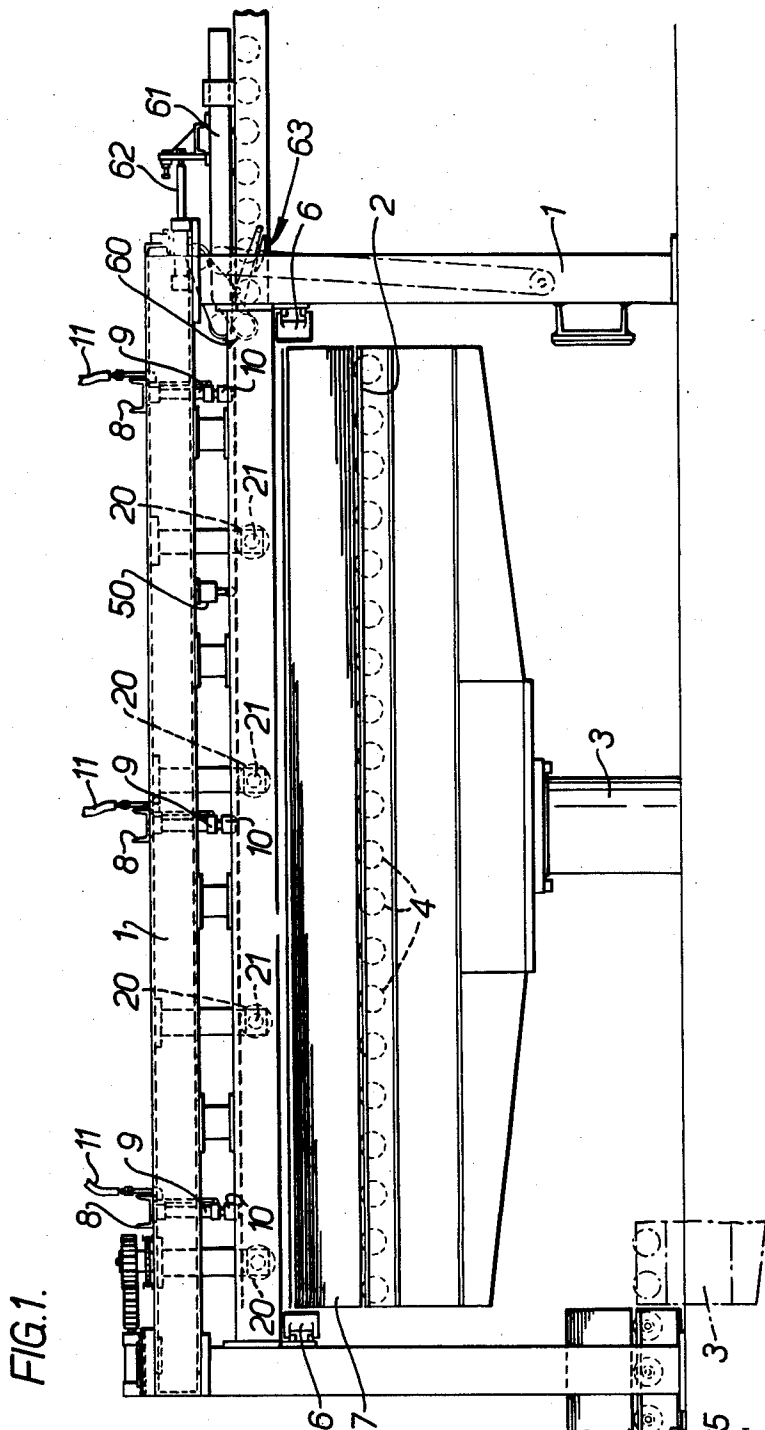


FIG. 1.

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3 Sheets-Sheet 2

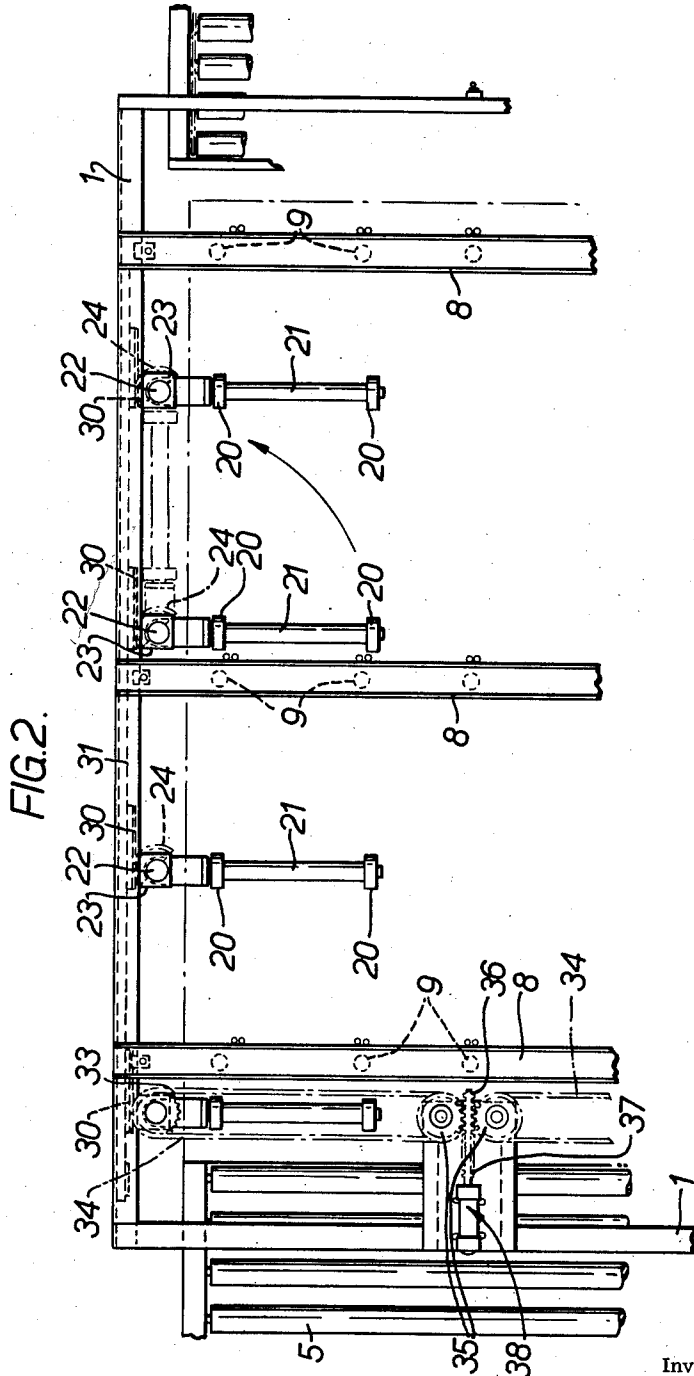


FIG. 2.

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3 Sheets-Sheet 3

FIG. 3.

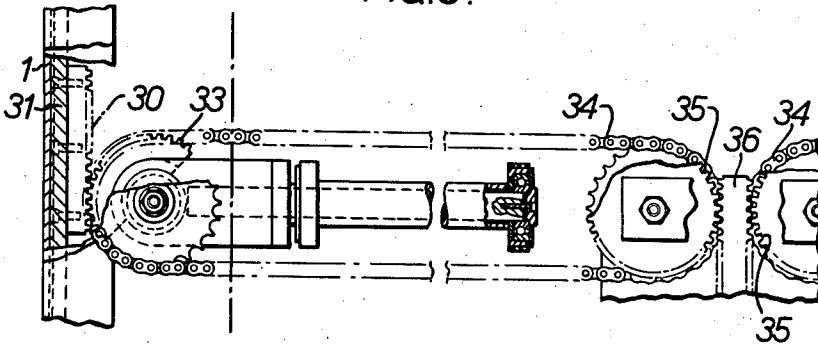
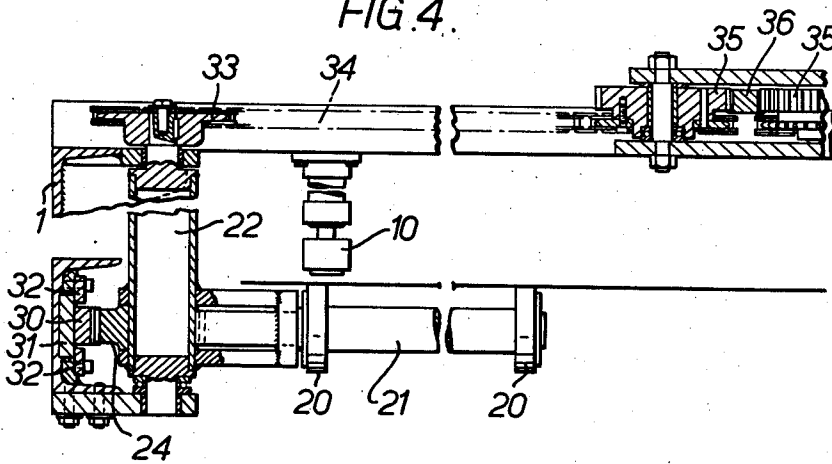


FIG. 4.



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3,140,088
**SHEET FEEDING OR DISCHARGING
MECHANISMS**

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Weybridge Machine Tool Company, Limited, Wey-
bridge, England, a British company
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Claims priority, application Great Britain June 26, 1961
3 Claims. (Cl. 271-4)

This invention concerns improvements in or relating to sheet feeding or discharging mechanism primarily intended for dealing with relatively stiff magnetisable, and especially ferro-magnetic, sheets such as mild steel sheets cut to a predetermined size and stacked and which have subsequently to be separately fed or discharged from the stack.

According to this invention there is provided a sheet feeding or discharging mechanism comprising a table upon which magnetisable sheets, such as iron or mild steel sheets for example, may be stacked one upon the other, this table being capable of being raised progressively or step-by-step as sheets are removed from the top of the stack, magnetic means for raising the uppermost sheet from the sheet or sheets therebelow so as to space said uppermost sheet from the last-mentioned sheet whilst maintaining it substantially parallel therewith, supporting means for interposal between the raised sheet and the sheet or sheets therebelow to support the raised sheet in position ready for feeding or delivery from the mechanism and means for moving said supporting means into the sheet supporting position.

According to a further feature of the invention the said magnetic means for raising the uppermost sheet of the stack from the sheet or sheets therebelow may comprise magnetic floaters arranged at intervals around the perimeters of the sheets and adapted to induce like polarities in the upper and succeeding sheet in the stack so that these sheets repel and separate from one another.

The said magnetic sheet raising means may also include pick-up devices which can be raised or lowered, and which are adapted to pick up the uppermost sheet when this has been separated by said floaters from the sheet or sheets therebelow.

According to a further feature of the invention, the said supporting means are adapted automatically to be interposed between the raised sheet and the sheet or sheets therebelow, and such supporting means may include rollers to facilitate the feeding or discharge of the sheets from the mechanism.

The said supporting rollers may be carried on a series of arms pivoted respectively at intervals along opposite sides of the mechanism and capable of being swung into position below a raised topsheet of a stack of sheets to support such raised sheet ready for discharge from the mechanism.

Said arms may be swung into and out of their supporting position through the medium of rack and pinion means and the movement of the racks of such means may be effected through pressure fluid operated cylinder and ram means.

Hydraulic means may be provided for raising the said

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table progressively or step-by-step. The table may also be lowered hydraulically.

The sheets may be initially supplied to the said table by a roller conveyor and the table itself may also be furnished with rollers adapted to form a continuation of said conveyor when the table is registered end-to-end therewith: the rollers of the table and said roller conveyor may be driven rollers.

The sheets may be fed or discharged from the said unit by any suitable feed or discharge mechanism which may include an arrangement as described in my co-pending application filed simultaneously with the present application and comprising a pair of feed rollers at least one of which is driven, a slide unit by which the said rollers are carried, means for advancing said slide unit towards the sheet to be fed, means for separating the said feed rollers relatively to one another as they are advanced with the said slide unit towards the sheet to be fed, means for then bringing the feed rollers into engagement with the opposite sides of the sheet to be fed so that the latter is gripped between the feed rollers along one edge portion and fed through the feed rollers as these rotate, means for withdrawing the slide unit and the feed rollers carried thereby to their initial positions and for subsequently separating the rollers at the end of the sheet feeding or discharging operation.

In order that the nature of the invention may be more readily understood and further features of the same made apparent, one embodiment of the same will now be described by way of example.

In the accompanying drawings:

FIGURE 1 shows in side elevation a sheet feeding or discharging mechanism in accordance with this invention;

FIGURE 2 is a part plan view of the mechanism shown in FIGURE 1;

FIGURE 3 is a fragmentary part sectional view, drawn on a larger scale, of a portion of the means for moving the supporting means into and out of their supporting position, and

FIGURE 4 is another fragmentary part sectional view, also drawn on a larger scale, of another position of such means.

The sheet feeding or discharging mechanism shown in the drawings comprises a generally rectangular framework 1 conveniently built up of rolled mild steel sections rigidly connected together.

Within this framework is arranged a horizontal table 2 which can be raised or lowered hydraulically, the table being supported on a central ram 3 working in a hydraulic cylinder (not shown) to which pressure fluid can be supplied as and when required either under manual control or automatically in order to raise the table progressively or step-by-step.

The table is furnished on its upper side with transversely arranged rollers 4 which are preferably driven rollers so that sheets may be fed on to the table from a roller conveyor 5 (of which the rollers are also preferably driven), the sheets fed from this conveyor being assisted on to the table by the driven rollers of the table, the latter rollers being parallel to those of the said roller conveyor which feeds the sheets on to the table when this is in its lowered position.

At intervals around the framework of the mechanism

and at the upper part thereof are arranged a series of magnetic floaters 6 of known form which comprise permanent magnets of appropriate strength and which, when the uppermost sheets of the stack of sheets 7 on the table 2 enter between them, magnetise these sheets by induction similarly to one another so that they repel one another so that the uppermost sheet rises from the sheet or sheets therebelow.

Beams 8 extending across the upper part of said framework carry at intervals therealong fluid operated cylinder and plunger devices 9 carrying electro-magnetic pick-ups 10 which can be energised to pick up the uppermost sheet of the stack when this is separated by the magnetic floaters 6 from the sheet or sheets therebelow, said electro-magnetic pick-ups being adapted to attract and hold the uppermost sheet, and the plunger and cylinder devices 9 by which the pick-ups 10 are carried then being adapted to operate to raise the sheet carried by the pick-ups away from the magnetic floaters and to hold such sheet in this elevated condition while supporting rollers are interposed below it. A sheet in this elevated position is indicated in broken lines in FIGURE 1.

The plunger and cylinder devices 9 by which the electromagnetic pick-ups 10 are carried are preferably adjustable in position along the beam 8 by which they are supported and these beams are preferably adjustable on the framework 1 so that the positions of the pick-ups can be adjusted to suit varying sheet sizes. The necessary fluid pressure is supplied to the plunger and cylinder devices (which are preferably double acting) of the pick-ups by suitable flexible hoses 11 from a pressure fluid supply source (not shown).

The sheet supporting rollers 20 are carried by pivotal arms 21. There are a series of these pivotal arms arranged at intervals along each longitudinal side of the framework 1 at the upper part thereof, the arms being pivotal about vertical axes and being carried rigidly by vertical pivots 22 journaled in brackets 23 spaced along the longitudinal sides of the framework. The arms 21 carry their supporting rollers 20 at spaced positions therealong and there may be two such rollers (as shown), one near the free extremity of each arm and one nearer to the pivot of such arm.

The pivot of each support arm 21 has fixed thereon a spur gear 24 which meshes with a rack 30 on a rack bar 31 extending in guides 32 longitudinally along the corresponding side of the framework 1 and reciprocable with respect to the latter, there being one rack bar for each series of supporting arms so that the support arms on each side of the framework are simultaneously operated by their rack bars to move them from a position in which they lie alongside the longitudinal side members of the frame work or alternatively extend inwardly at right angles to such longitudinal members in order to support a raised sheet within the framework.

The rack bars 31 are adapted to be reciprocated by spur gears 33 driven by chain drives 34, from a pair of spur gears 35 located at the receiving end of the mechanism centrally thereof and adapted to be rotated simultaneously to the same extent in opposite directions by a reciprocable rack 36 arranged between them and meshing with both of them, this rack being operated from the ram 37 of a double acting pressure fluid operated ram and cylinder assembly 38 carried by the framework 1.

The pressure fluid employed for effecting operation of the said support arms and the raising and lowering of the said electro-magnetic pick-ups is preferably a hydraulic fluid.

Means are provided for discharging or withdrawing the raised upper sheet of the stack from the said unit and these means may comprise feed rollers 60 as described in my aforesaid co-pending application as previously explained.

Briefly, these feed rollers are carried by a slide 61 which is adapted to be reciprocated by a hydraulic piston and cylinder unit 62. Cam means 63 are adapted to separate

the feed rollers 60 as they are advanced towards a sheet to be fed and to allow them to be brought into engagement with the opposite sides of the sheet along an edge portion thereof, after which the sheet will be fed through the feed rollers.

The operation of the mechanism may be achieved through the medium of a variable speed electric motor (not shown) which after being switched on operates by means of a cam, an electric micro-switch serving to energise a solenoid on a four-way pressure fluid control valve which among other things causes the electric-magnetic pick-up plunger and cylinder devices 9 to descend and pick up the upper sheet separated from the stack by the magnetic floaters 6. At the bottom of the movement of the said electric-magnetic pick-ups, the fluid pressure built up causes the automatic adjustment of a sequence valve and permits the return of the electro-magnetic pick-ups to their original raised positions so that these raise the sheet engaged by the pick-ups.

One or more plunger operated electric micro-switches 50 are operated by the raised sheet and cause the movement of the support arms 21 from their out-of-the-way position alongside the longitudinal members of the framework 1 to their inwardly extended positions below the raised sheet. As soon as the support arms 21 have moved fully into their supporting position, the fluid pressure built up serves to operate the said four-way valve and to bring into operation the sheet discharge or delivery means of the unit. If these discharge or delivery means are of the type described in my aforesaid co-pending application, the rollers thereof separate, move in towards the sheet, close and grip an end of the sheet and then withdraw the latter from the unit. As the said rollers grip the sheet the said electro-magnetic pick-ups are de-energised through the operation of an electric micro-switch actuated by the inward movement of the said delivery rollers so that the sheet supported by the pick-ups is released so as to be supported solely by the said supporting rollers over which the sheet is withdrawn by the said delivery rollers. The withdrawal of the sheet from the mechanism is adapted to release a further electric micro-switch to cause the support arms to move back to their out-of-the-way position. When the said top sheet has been withdrawn from the unit the above described cycle of operations is recommended.

I claim:

1. A sheet feeding mechanism for magnetizable sheets, such as iron and mild steel sheets, said feeding mechanism comprising in combination, a vertically adjustable table for supporting the stacked sheets, and movable upwardly as each topmost sheet is removed therefrom; magnetic means positioned alongside the stacked sheets and effective to establish magnetic fields repelling the topmost sheet from the next underlying sheet; horizontal arms pivotal about vertical axes adjacent the side edges of said table, for movement between a retracted position relative to the stacked sheets and a support position extending over the stacked sheets, said arms being disposed at a common level above the uppermost sheet on the stack; means interconnecting all of said arms for movement in unison, in a common horizontal plane, between the retracted position and the support position; an operating means for said arms; a series of electromagnets above the stacked sheets; actuator means operable to move said electromagnets into magnetic gripping relation with the topmost sheet and then to lift said electromagnets to raise the topmost sheet to a holding level above said horizontal arms; means operable by a thus raised sheet, as it reaches said holding level, to actuate said operating means to swing said arms in unison to the support position beneath the raised sheet; gripping means movable inwardly to engage a sheet at the holding level to grip and withdraw such sheet laterally relative to said table; means operable, responsive to movement of said arms to the support position, so to move said gripping means inwardly; and means

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operable, responsive to such inward movement of said gripping means, to de-energize said electromagnets to release the raised sheet onto said support arms.

2. A sheet feeding mechanism, as claimed in claim 1, including rollers on said arms rotatable about horizontal 5 axes.

3. A sheet feeding mechanism, as claimed in claim 1, in which said operating means includes a gear rotatable with each support arm, rack means conjointly engaged with said gears, and a fluid pressure actuator operable 10

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to reciprocate said rack means to rotate said gears to move said support arms between the retracted position and the support position.

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