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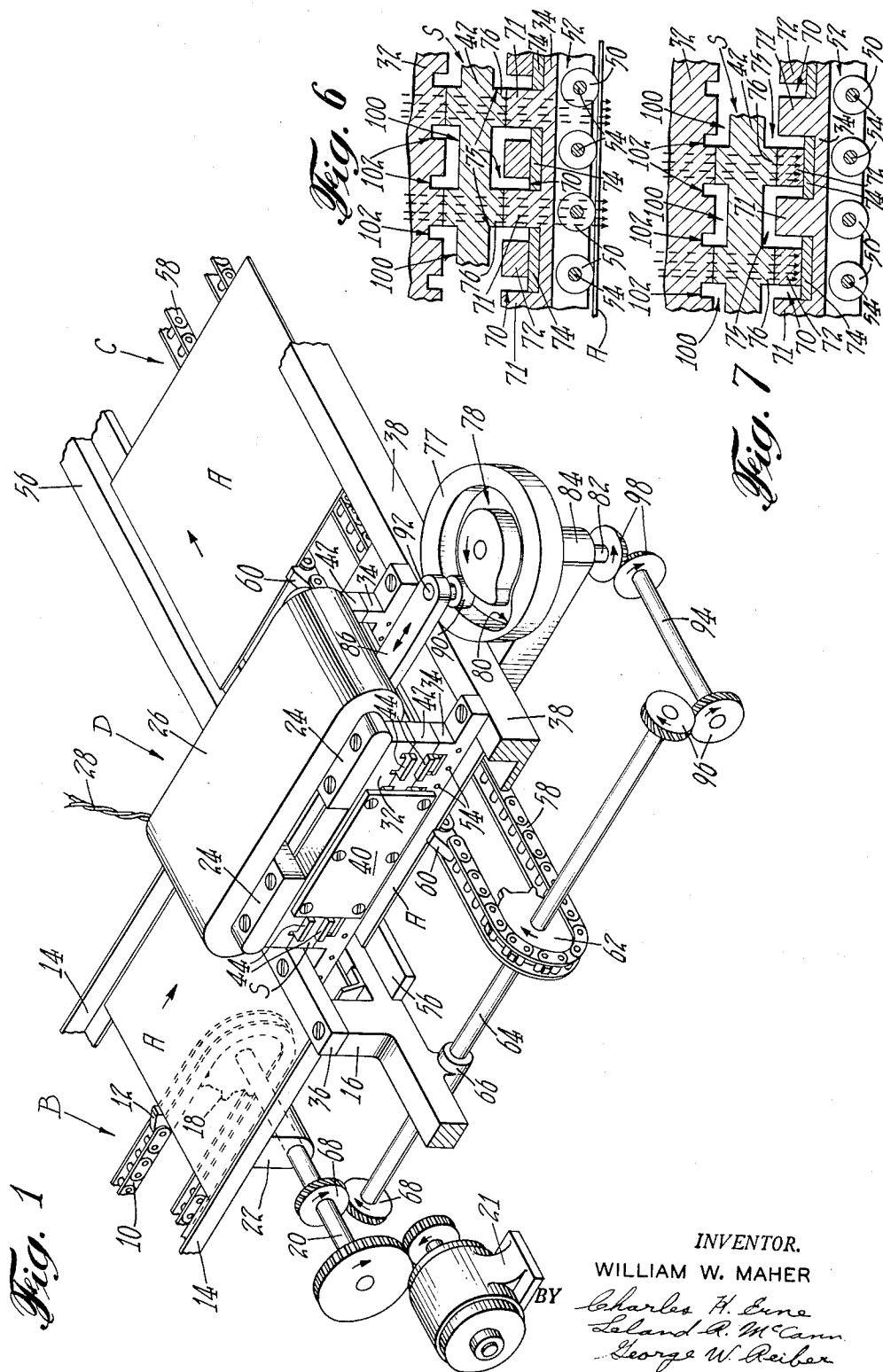
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2,726,752

MAGNETIC SHEET TRANSFER DEVICE

Filed July 20, 1954

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

Fig. 2

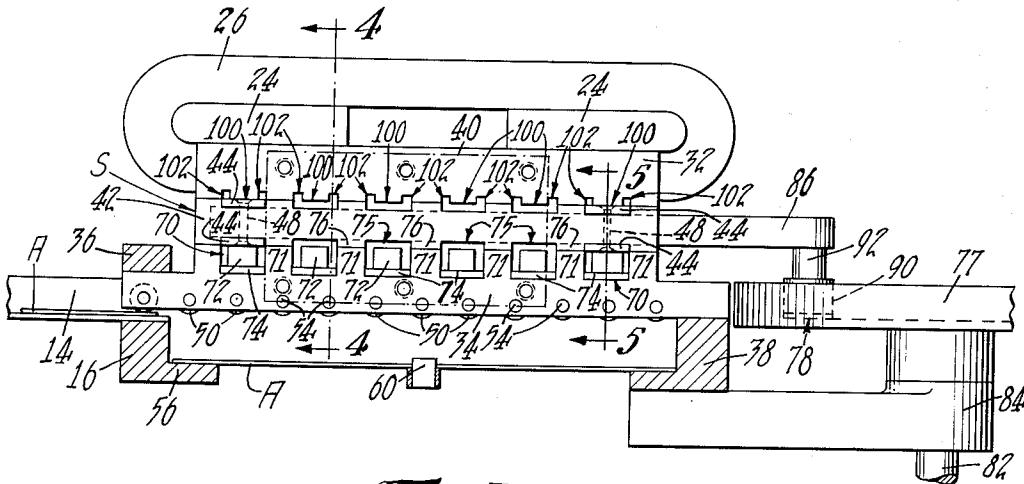


Fig. 3

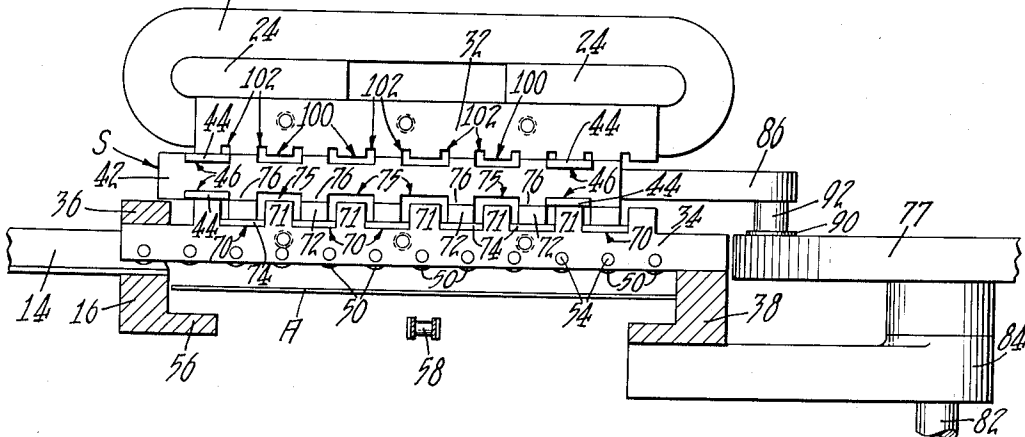


Fig. 4

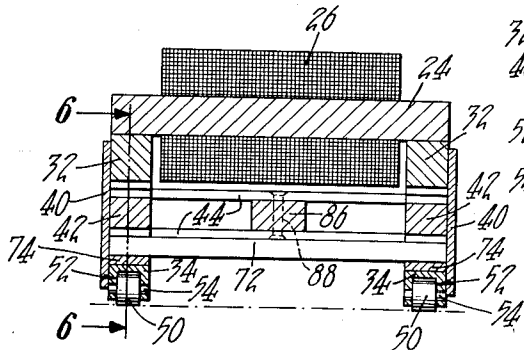
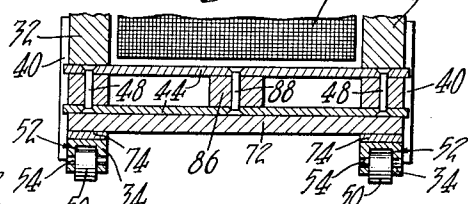


Fig. 5



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MAGNETIC SHEET TRANSFER DEVICE

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7 Claims. (Cl. 198—41)

The present invention relates to sheet conveyors and has particular reference to a transfer device in which magnetizable sheets are received from a primary conveyor and supported magnetically until they are in proper position to be advanced by an auxiliary conveyor, at which time mechanically actuated means come into operation to shunt the magnetic sheet-supporting circuit and thus release the sheets onto the auxiliary conveyor.

This invention is in some respects an improvement over the invention covered by my United States Patent 2,672,931, issued on March 23, 1954, on "Sheet Cutting Machine." In the device illustrated in this issued patent, magnetizable strips are suspended by electromagnetic devices over a take away conveyor. At the proper time, electric switches are opened to break the electric circuits which energize the electromagnets, and the deenergized magnets release the strips onto the conveyor. In the present mechanism, on the other hand, release of the sheet is effected mechanically by shunting the magnetic flux away from the sheets.

Under certain operating conditions, such mechanical release of the sheets is highly desirable since it permits simplification of the electrical components of the machine.

An object of the invention, therefore, is the provision of a magnetic sheet supporting device of simple construction which requires a minimum of maintenance.

Another object is to provide a magnetic device for transferring sheets from one conveyor to another, the device being provided with sheet holding rails which can be demagnetized mechanically, preferably by means of cam actuated elements which are geared to the conveyor drive to insure correctly timed release of the sheets.

Still another object is to provide such a device wherein the mechanically actuated movable parts are comparatively small in size and of low inertia to permit rapid reciprocation without excessive strain on the actuating mechanism.

Yet another object is to provide such a device wherein the magnetic field may be created by permanent magnets as well as by electromagnets, since the magnetic field is not broken but is merely shunted to release the sheets.

Numerous other objects and advantages of the invention will be apparent as it is better understood from the following description, which, taken in connection with the accompanying drawings, discloses a preferred embodiment thereof.

Referring to the drawings:

Figure 1 is a perspective view of an apparatus embodying the principles of the instant invention, parts being broken away;

Fig. 2 is an enlarged side elevation of the magnetic sheet supporting device of the instant invention with the operating parts in position to establish a magnetic circuit through the sheet and thus hold the sheet in suspension;

Fig. 3 is a view similar to Fig. 2 but showing parts positioned to shunt the magnetic circuit away from the sheet and thus release the sheet;

Figs. 4 and 5 are vertical sections taken substantially

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along the lines 4—4 and 5—5, respectively, of Fig. 2, parts being broken away;

Fig. 6 is a fragmentary vertical section taken substantially along the line 6—6 of Fig. 4, the parts being positioned to attract the sheet, parts being broken away; and

Fig. 7 is a vertical section similar to Fig. 6 but showing the parts positioned to shunt the magnetic flux away from the sheet.

As a preferred or exemplary embodiment of the invention, the drawings illustrate a sheet conveying mechanism in which transfer of magnetizable metal sheets A from a primary runway B to an auxiliary runway C is effected by a magnetic transfer device D. The sheets A, which are rectangular in configuration, are fed in succession along the primary runway B in timed and spaced relationship by means of an endless chain conveyor 10 having a plurality of equally spaced feed dogs 12 mounted thereon. The runway B includes a pair of spaced side guides 14 which guide the sheets against lateral displacement and which are mounted in a frame 16 which may be the main frame of the mechanism. The delivery end of the chain conveyor 10 operates around a drive sprocket 18, which is mounted on and rotated by a drive shaft 20 carried in a bearing 22 mounted on the machine frame 16. Drive shaft 20 may be driven from any suitable source of power, such as an electric motor 21. The other end of the conveyor 10 operates around a suitable idler sprocket (not shown).

As the sheets A are advanced beyond the delivery end of the conveyor 10, they are received by the magnetic transfer device D which functions to attract and hold the sheet in suspension as they move into position over the auxiliary runway C, which is disposed at right angles to the runway B, and then releases them in correctly timed relationship onto the runway C. The transfer device D, which in the present embodiment is energized electrically, comprises a pair of spaced flat core members 24 around which is wound an electric coil 26 provided with a pair of leads 28 (Fig. 1) which are connected to a suitable source of direct current. Secured to opposite sides of both of the core members 24 and depending therefrom is a pair of elongated magnetic poles 32. The core members 24 and the poles 32 comprise what may be termed a magnetic core unit, and it will be obvious that this core unit may be formed as a single piece, if so desired. It is also obvious that flat permanent magnets may be substituted for the electrically energized core members 24.

A stationary sheet holding ferromagnetic rail 34 is spaced below each pole 32 and is mounted at one end on a support strap 36 which is secured to the frame 16 and at the other end on a guide rail 38 which comprises the outside guide of the auxiliary runway C and may also be part of the frame of the machine. A pair of nonmagnetic side plates 40 maintains the poles 32 properly spaced above the holding rails 34 and provides the means for supporting the core unit.

The holding rails 34 are normally connected magnetically with the magnetic core unit to enable them to attract and support the sheets A as they are received from the conveyor 10 by means of a pair of longitudinally movable ferromagnetic slides 42 which are interposed between the poles 32 and holding rails 34 (see Figs. 2 and 6). These slides 42 are connected together by means of two sets of nonmagnetic crossties or plates 44 which are set flush into recesses 46 formed adjacent the ends of the slides 42 and are secured to the slides by means of nonmagnetic rivets 48 to form a slide assembly. This slide assembly is generally designated by the letter S, and is comparatively small and light in weight in comparison with the nonmovable portion of the transfer device D.

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As the sheets A are fed from the runway B by the conveyor 10, they are attracted by the magnetized holding rails 34 and are thus magnetically suspended while they continue their forward motion across the bottom of the transfer unit D into position over the auxiliary runway C. During the early portion of their travel across the magnetic transfer unit D, the sheets A are positively propelled by the conveyor 10. However, as can be seen in Fig. 1, the conveyor does not extend closely enough to transfer unit D to complete the delivery of the sheets, and consequently the sheets must complete the final portion of this travel under their own momentum. In order to insure free movement of the sheets A across the bottom of the magnetic transfer unit D, the stationary sheet holding rails 34 are provided with nonmagnetic antifriction rollers 50 disposed in longitudinal grooves 52 formed in the bottoms of the rails 34. The rollers 50 are mounted on pins 54 and project only slightly beneath the rails 34 in order to keep the gap between the sheets A and the rails 34 at a minimum.

The forward movement of each sheet A ceases when the sheet hits against the outside guide rail 38 of the runway C. The runway C also includes an inner guide 56 and an endless conveyor 58 which carries a plurality of feed dogs 60 mounted thereon at spaced intervals and operates around a drive sprocket 62 and an idler sprocket (not shown). The drive sprocket 62 is mounted on a shaft 64 which is journaled in a bearing 66 and is driven from the main drive shaft 20 in time with the other parts of the machine through a pair of worm gears 68.

In order to have the sheets A successively engaged by the feed dogs 60 of the conveyor 58 and propelled along the runway C, it is necessary that they be released by the magnetic transfer unit D in time with the conveyor 58, so that each sheet can drop by gravity onto the runway C just in advance of a feed dog. This release of the sheets A is brought about by demagnetizing the sheet holding rails 34.

To provide for this, the upper side of each rail 34 is crenelated or provided with a series of equally spaced recesses 70 and ribs 71, the recesses and ribs in one rail being longitudinally aligned with those in the opposite rail. A corresponding number of magnetic keepers or shunt bars 72, which extend transversely between the rails 34 and are formed of a magnetizable material such as iron or steel, are secured in the recesses 70 with their upper surfaces flush with or disposed in a common plane with the upper surfaces of the ribs 71. The shunt bars 72 are smaller in cross-section than the recesses 70, and rest upon small nonmagnetic plates 74 so that there is a complete low-permeability U-shaped gap of considerable dimension between the shunt bars 72 and the rails 34.

As best seen in Figs. 2 and 6, the bottom portions of the slides 42 are provided with a series of recesses 75 and ribs 76 which are given the same spacing as the recesses 70 and ribs 71 of the rails 34. Thus, when the ribs 76 and 71 are in vertical alignment, the rails 34 are magnetically connected to the poles 32 and are magnetized to attract the sheets A. To demagnetize the rails 34 and thus permit the sheet to drop onto the runway C, the slide assembly S is moved to bring the ribs 76 of the slides 42 into alignment with the ends of the shunt bars 72 and thus shunt the magnetic circuit across the poles 32 (see Figs. 3 and 7) and away from the holding rails 34. There is no tendency for the magnetic lines of force to jump from either the slide 42 or the shunt bars 70 to the holding rails 34 because the shunt bars offer the path of least resistance for the magnetic circuit.

Movement of the slide assembly S is effected mechanically by means of a cam 77 which is formed with a circular cam track 78 having a short high portion 80 (Fig. 1). The cam 77 is mounted on a short vertical shaft 82 journaled in a bearing 84 which forms a part of the main frame 16.

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The slide assembly S is operatively connected with the cam 77 through an elongated bar 86 (see Figs. 1, 2, 4 and 5), which extends between both sets of tie plates 44 and is rigidly secured thereto by rivets 88 and carries at one end a cam roller 90 which is mounted on a pin 92 and operates in the cam track 78. Thus, rotation of the cam 77 results in reciprocatory motion of the slide assembly S longitudinally along the holding rails 34, the ribs 76 of the slides 42 being brought into alignment with the shunt bars 72 to demagnetize the holding rails 34 each time the cam roller 77 enters the high portion 80 of the cam track 78.

The cam 77 is rotated in time with the other parts of the machine so that the holding rails 34 remain magnetized during the intervals in which the sheets A are received from the conveyor 10 and move across the bottom of the transfer device D, and are demagnetized at the proper time to release the sheets onto the conveyor 58 in front of the feed dogs 60. The released sheets are thereafter fed by the conveyor 58 to any suitable place of deposit. Rotation of the cam 77 is effected from the main drive shaft 20 through the shaft 64 and a short connecting shaft 94, which is journaled in suitable bearings (not shown). The shaft 94 is geared to the shaft 64 by means of a pair of worm gears 96 and to the cam shaft 82 by a pair of bevel gears 98, the gearing ratio being such that the cam 77 makes one revolution for each sheet A.

Since the magnet core members 24 remain constantly energized, the slides 42 are subject to a constant magnetic attraction from the magnet poles 32 and are thus maintained in engagement with the poles. In order to lessen the friction between the slides 42 and poles 32, their mutually contacting faces are suitably recessed as at 100, 102, respectively (see Figs. 6 and 7) to reduce the areas of contact.

If the transfer device D is to be run at very high speeds, it may be desired to provide suitable anti-friction bearings (not shown) to maintain the slides 42 spaced very slightly from the pole pieces 32, the holding rails 34 and the shunt bars 72 to thereby reduce friction to a minimum. It is not necessary that these parts be in actual contact with each other provided, of course, that the gaps between them are minute enough to offer no substantial obstacle to the establishment of the desired magnetic circuits within the parts.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description, and it will be apparent that various changes may be made in the form, construction and arrangement of the parts without departing from the spirit and scope of the invention or sacrificing all of its material advantages, the form hereinbefore described being merely a preferred embodiment thereof.

I claim:

1. In a magnetic device for transferring magnetizable articles from a primary conveyor to an auxiliary conveyor, the combination of a stationary magnetic core unit having oppositely disposed, stationary magnetic poles, a pair of stationary article holding rails spaced below said stationary poles, shunt means extending transversely between said rails and spaced therefrom by a gap of low permeability, a pair of slides positioned between said poles and said rails, said slides when in one position magnetically connecting said poles with said rails to thereby energize said rails when an article is received from said primary conveyor and when in another position magnetically connecting said poles with said shunt means to deenergize said rails and thereby release said article onto said auxiliary conveyor, and actuating means for moving said slides to each of said positions in time with said conveyors.

2. The mechanism of claim 1 in which said actuating means is cam actuated in time with said conveyors.

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3. The mechanism of claim 1 in which said core unit is energized electromagnetically.

4. The mechanism of claim 1 in which said article holding rails are transversely spaced from each other and provided with article contacting anti-friction rollers to facilitate longitudinal movement of said articles along said rails.

5. The mechanism of claim 1 in which said shunt means comprise a plurality of shunt bars having their ends disposed in recesses formed in the upper portions of said sheet holding rails, said shunt bars being separated from said rails by gaps of low permeability.

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6. The mechanism of claim 5 in which the unrecessed upper surfaces of each of said rails and the upper surfaces of the adjacent portions of said shunt bars are disposed in a common plane.

7. The mechanism of claim 6 in which said slides are provided at their lower portions with spaced ribs which contact said unrecessed portions of said rails when said slides are in one position and which contact said shunt bars when said slides are in another position.

No references cited.