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SEPARATION OF PILED METAL SHEETS

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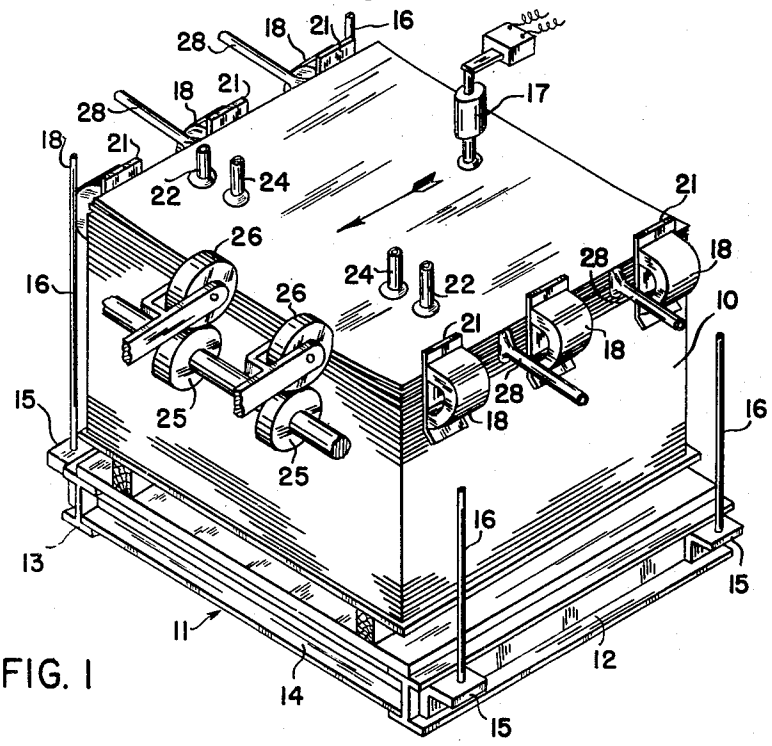



FIG. 1

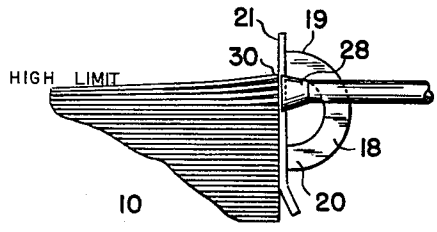



FIG. 2

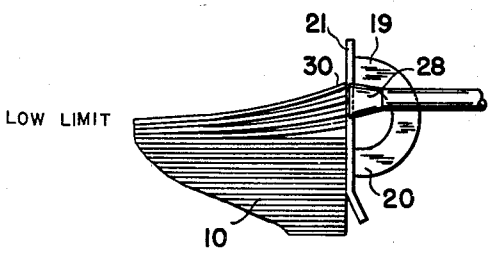



FIG. 3

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# SEPARATION OF PILED METAL SHEETS

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2 Claims. (Cl. 271—18)

This invention relates to improvements in separation of piled metal sheets, and has to do with a novel means and method in which air blasts are combined with a particular flow of magnetic current to make possible effective sheet separation.

The use of magnets along the sides of a pile of metal sheets to separate the edges of the uppermost sheets is well known in the art. Magnets employed in this way and for this purpose are successful, especially for sheets that are relatively narrow, but as the width of the sheets increases a greater and greater part of the intermediate portion of each sheet sags down and rests heavily upon the next sheet therebeneath. Thus the separation of the uppermost sheets is not complete and the tendency for them to stick together as the top sheet is fed off presents a difficult problem. Oftentimes, the sheets are treated with an oil film to prevent rusting. This also causes the sheets to adhere to one another and makes proper sheet separation difficult.

The top of the pile must be maintained approximately at a given level, that is to say the level of the pull out rolls through which each sheet passes as it leaves the pile. It is not feasible to raise the pile the minute distance equivalent to the thickness of a sheet for each feed cycle, but by means of a feeler control the body of the pile may be raised intermittently to maintain it within upper and lower limits a quarter or half inch apart.

The present invention utilizes improvements for combining air blasts with magnetic separation so as to make the separation effective for large sheets. The air blast nozzles, which may be flattened vertically, are fixed at a predetermined height, as are also the magnets. In order to obtain the best results from the air blasts, the nozzles should be equally effective with the pile at the low limit as well as at the high limit. I have discovered that this is possible if magnet means is arranged in a particular manner, that is with the poles spaced vertically. When this is done the edge of each top sheet as it becomes the top sheet rises to a given fixed level, and it does this in spite of the fact that the level of the central part or body of the pile changes between high and low limits through a distance of the order of one-quarter or one-half inch.

I dispose the magnets at a height such that the side edge of the top sheet at the high limit of the pile will be somewhat above the body of the pile, so that whatever the height of the body of the pile may be, the side edges of the uppermost sheets will be fanned out vertically. The air blast nozzles are fixed in position and mounted at a height such that they will blow air inwardly through the fanned out edges of the uppermost sheets mainly below the top sheet, the side edge of which is disposed at a height dependent upon the action of the magnet means.

I have found that it is possible to bring about the positioning of the side edge of the top sheet at an unvarying level only when the magnet means comprises a pair of vertically spaced magnetic poles. This is accomplished conveniently by using horseshoe magnets. The side edge of the top sheet of the pile then takes a position approximately even with the lower edge of the upper pole of the magnet. Horizontal mounting of the magnets will not accomplish the purpose satisfactorily, for then the level of the side edge of the top sheet is not constant but descends as the level of the body of the pile descends from its upper limit toward its lower limit. If that condition obtains the force of the air blast is dissipated by flow above the top sheet, and sheet separation is not satisfactory.



One of the objects of the invention therefore is the provision of novel means for effecting separation of magnetizable sheets preparatory to taking the top sheet and feeding it off the pile.

Another object is the provision of combined magnetic and air separation such as to insure correct separation and feeding throughout variations in the height of the body of the pile due to intermittent action of pile elevating mechanism.

Other objects and features of novelty will appear as I proceed with the description of that embodiment of the invention which, for the purposes of the present application, I have illustrated in the accompanying drawing, in which

Fig. 1 is a fragmental perspective view of a pile feeder embodying the invention.

Fig. 2 is a detail elevational view of a fragment of a pile with elements of the sheet separating means of the invention in operative relation to the pile, the body of the pile being shown raised to its high limit.

Fig. 3 is a view similar to Fig. 2 after the body of the pile has descended to its low limit and is about to be raised.

As sheet metal feeders of the type with which this invention is to be used are well known in the art, only so much of the feeder is herein illustrated as is believed to be necessary for a complete understanding of the invention by those skilled in the art.

Referring to Fig. 1, a pile of sheets **10** responsive to magnetic lines of force, is carried on a pile support **11** of a pile feeder for magnetizable sheets. The pile support comprises side arms **12** and **13** which may be I-beams connected at their forward ends by a crossbar **14** and similarly connected at their rear ends. Each of the arms **12** and **13** is provided with a pair of brackets **15**, these brackets being supported by cables **16** of the pile feeder. It is to be understood that the pile support **11** is provided with means for raising it intermittently during automatic feeding in response to control by pile height governing means to maintain the top of the body of the pile between predetermined high and low limits.

This means preferably embodies a pile height feeler **17** which engages the body of the pile along the median line thereof near the rear edge of the top sheet. This feeler rises to permit the top sheet to be drawn off and then descends to engage the next sheet therebeneath. When a number of sheets have been withdrawn sufficient to reduce the level of the body of the pile to a predetermined low point, electric switch means operated by the feeler effects controls which cause the pile to rise to its predetermined high limit. The details of such control means are fully disclosed in my copending application Serial No. 553,556, filed December 16, 1955.

Along each side of the pile of sheets **10** there are fixedly mounted a plurality of horseshoe magnets **18** and their upper and lower poles **19** and **20** facing toward the pile and disposed closely adjacent thereto. Preferably guide plates **21** of non-magnetic material, such as brass, are supported by the magnets. The side edges of the pile may nearly bear against these plates. While

permanent magnets are shown, electromagnets may be used if desired.

As is conventional in the art the top sheet is grasped by suckers **22** which descend at the proper time in the cycle and lift the forward end of the sheet, after which a pair of suckers **24** take the sheet, the suckers **22** letting go. Suckers **24** then advance, carrying the front edge of the sheet into the bight of pull out rolls **25**, **26** of conventional construction and operation. The rolls **26** swing up and down through a small arc to admit the sheets one after another and to provide traction from the continuously driven rolls **25**.

At each side of the pile there are air blast nozzles **28**, each pair of magnets having a nozzle between them. Preferably the air blast is continuous. The magnets on opposite sides of the blast nozzle hold the edge of the top sheet at the level indicated at **30** in Fig. 2, and fan out several of the uppermost sheets below the top sheet. The air flows into the pile between adjacent fanned out sheets and below the top sheet, tending to float the latter and facilitate its movement off the pile by the advancing suckers **24**.

Operation. Assuming that the body of the pile is in the high limit position, as indicated in Fig. 2, with the uppermost sheets of the pile fanned out vertically by the action of the magnets and air nozzles, the lifting suckers **22** grasp the top sheet and raise it to a level where the advancing suckers **24** may take it. The latter suckers then carry its forward edge into the bight of pull out rolls **25**, **26**, which impel it forward. As soon as the sheet being fed uncovers the next sheet therebelow, the edges of the latter sheet rise to the position indicated at **30** in Fig. 2 and the described procedure is repeated, a new sheet being added to the bottom of the series of fanned out sheets. When the level of the body of the pile descends sufficiently because of the sheets that are fed off, the condition of the pile represented in Fig. 3 is arrived at. Here the body of the pile is shown at its low limit, in other words at the point where the feeler **17** acts to bring about the elevation of the pile from its low limit to its high limit. However, between the conditions represented in Figs. 2 and 3, the side edges of the top sheet at each stage of operation rise to the



height indicated at **30** in Figs. 2 and 3, and the air continues to pass into the spaces between the fanned out sheets without any appreciable loss of air flowing above the top sheet. Hence sheet separation is equally effective throughout the pile movements between the high and low limits indicated in Figs. 2 and 3.

Having thus described my invention, I claim:

1. In a pile feeder for feeding magnetizable sheets one at a time from the top thereof, horseshoe magnets adjacent at least one side edge of the pile, said magnets having their magnetic poles vertically spaced approximately opposite the top of the pile, means for maintaining the top level of the body of the pile between predetermined high and low limits, said magnets holding the side edges of the uppermost sheets fanned out with the edge of the top sheet at approximately the same level regardless of the level of the body of the pile, air blast means located at a fixed level adjacent the top of the pile and directed to blow air into the pile through the fanned out edges of the sheets below the edge of the top sheet, and means for taking the top sheet and feeding it from the pile.

2. In a sheet feeder for feeding magnetizable sheets one at a time from the top of a pile, permanent horseshoe magnets on opposite sides of the pile, said magnets having their magnetic poles vertically spaced approximately opposite the top of the pile, means for maintaining the body of the pile with its top level between predetermined high and low limits, said magnets holding both side edges of the uppermost sheets fanned out with the edges of the top sheet at approximately the same level throughout variations in the level of the pile, air blast means on both sides of the pile located at a fixed level adjacent the top of the pile and directed to blow air into the pile through the fanned out edges of the sheets below the edges of the top sheet, and means for taking and forwarding the top sheet from the pile.

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