Aug. 27, 1963 A. C. REINCKE 3,101,941

SHEET MATERIAL SEPARATOR AND HANDLING DEVICE

Filed May 31, 1960 3 Sheets-Sheet 1

FIG. 1

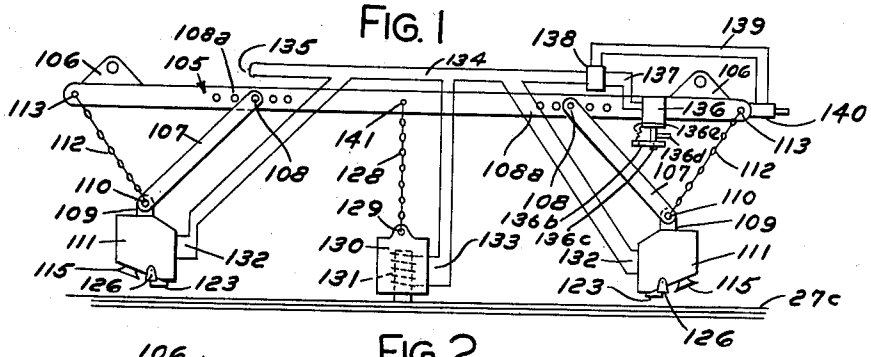


FIG. 2

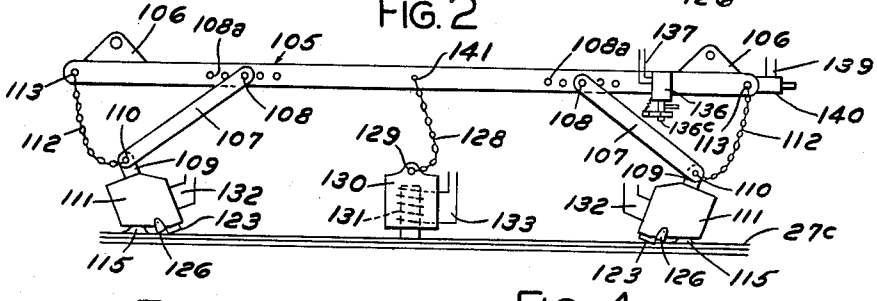


FIG. 3

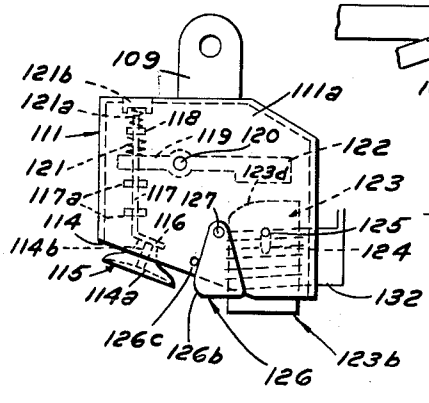
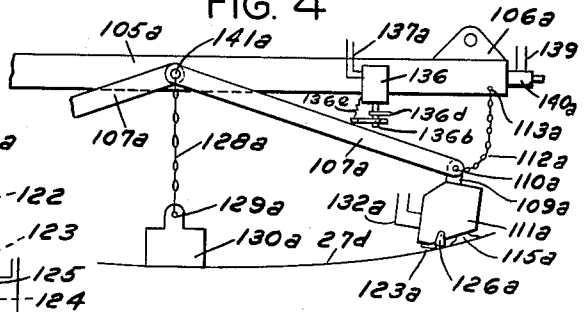


FIG. 4



INVENTOR.
ADOLF C. REINCKE
BY
Donnelly, Mentag & Harrington
ATTORNEYS

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SHEET MATERIAL SEPARATOR AND HANDLING DEVICE

Filed May 31. 1960

3 Sheets-Sheet 2

FIG. 5

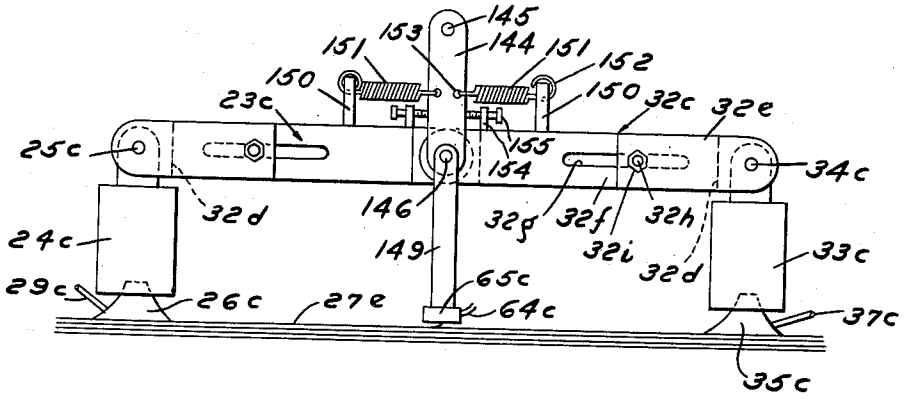
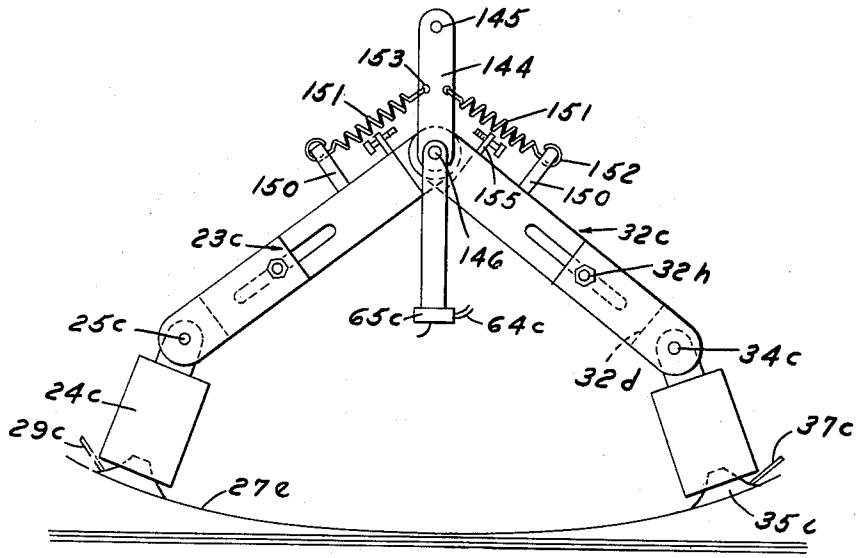


FIG. 6



INVENTOR.
ADOLF C. REINCKE
BY
Donnelly, Ingentag & Harrington
ATTORNEYS

Aug. 27, 1963 A. C. REINCKE 3,101,941

SHEET MATERIAL SEPARATOR AND HANDLING DEVICE

Filed May 31. 1960 3 Sheets-Sheet 3

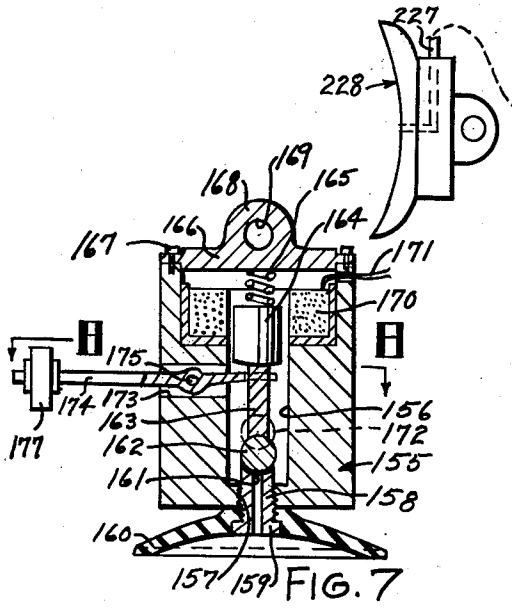


FIG. 7

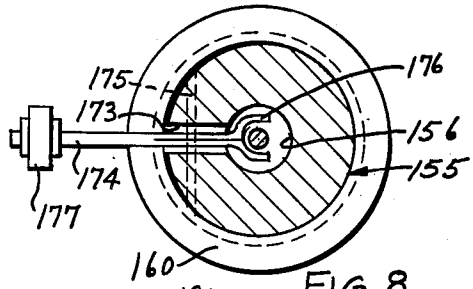


FIG. 8

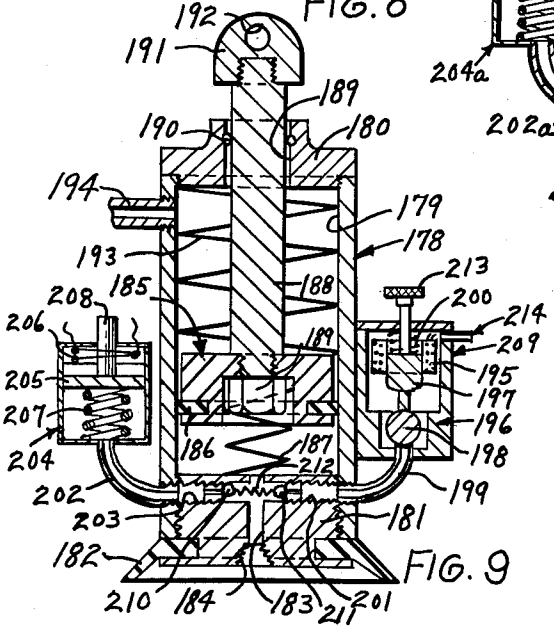


FIG. 9

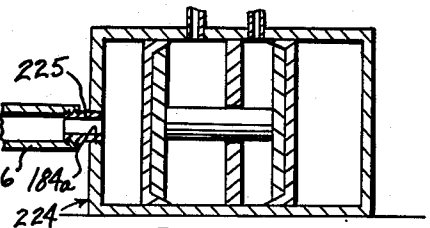


FIG. 11

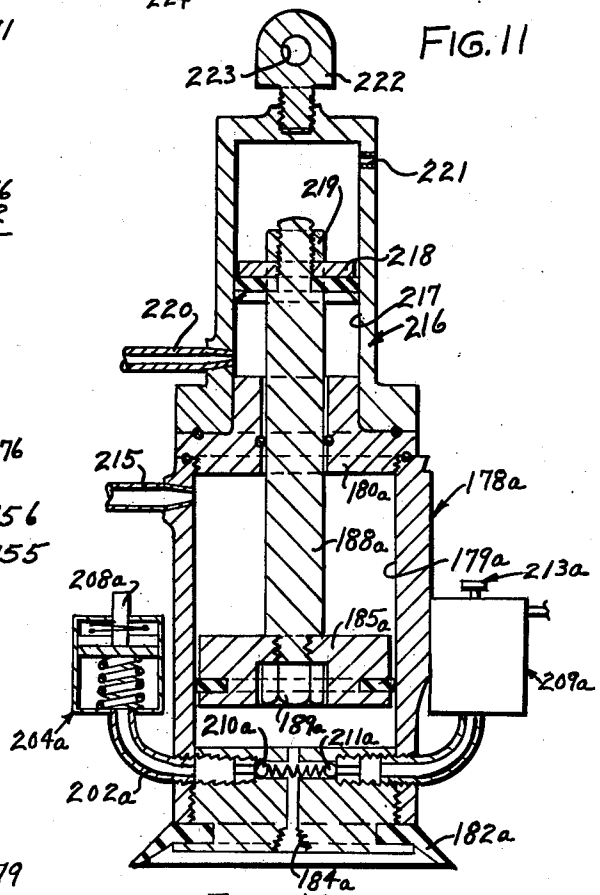


FIG. 10

INVENTOR.
ADOLF C. REINCKE
BY
Donnelly, Mentag & Harrington
ATTORNEYS

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3,101,941

SHEET MATERIAL SEPARATOR AND HANDLING DEVICE

Adolf C. Reincke, 23335 Clairwood, St. Clair Shores, Mich.

Filed May 31, 1960, Ser. No. 32,669
13 Claims. (Cl. 271—27)

This invention relates to flexible sheet material separating and handling apparatus, and more particularly to apparatus of this type which is capable of separating and lifting flexible sheets one by one from a stack of such sheets, which sheets normally tend to stick together due to suction therebetween or which tend to stick together due to oil, grease, and/or the like, which may be spread over the abutting surfaces of the sheets.

Heretofore, much difficulty has been experienced in flexible sheet feeding apparatus in preventing the picking up of more than one sheet at a time. The sheets in a stack of clean flexible material have a tendency to stick together until the air has been admitted between them, whereby when the top sheet is picked up, the second sheet tends to stick thereto and be picked up therewith. The same sticking tendency is aggravated when the surfaces of the flexible sheets are covered with oil, grease and/or other like substances which increase the tendency of one sheet to adhere to another. Accordingly, it is the primary object of this invention to provide a separating and handling apparatus which may be used with a crane or other elevating equipment, and which is adapted to grip and separate the top sheet from a stack of flexible sheet material by peeling or bending upwardly a pair of oppositely disposed edges or corners of the top sheet, whereby the adhesion forces between the top sheet and the second sheet are broken and the top sheet may be lifted from the stack without moving the second sheet.

It is another object of this invention to provide a flexible sheet material separating and handling apparatus which is adapted to lift sheets one by one and overcome any tendency of the sheets to stick together by bending the sheets, and which is capable of straightening the sheets, if desired, for feeding the sheets into a work position in a straightened condition.

It is still another object of this invention to provide a flexible sheet material separating and handling apparatus which may be used singly or plurally, and which may be made in any desired size.

It is a further object of this invention to provide a flexible sheet material separating and handling apparatus which is simple and compact in construction, economical of manufacture, and efficient in operation.

It is a still further object of this invention to provide a novel gripping means for incorporation in a flexible sheet material separating and handling apparatus.

Other objects, features and advantages of this invention will be apparent from the following detailed description and appended claims, reference being had to the accompanying drawings forming a part of the specification wherein like reference numerals designate corresponding parts of the several views.

FIG. 1 is a side elevational view of a first embodiment of the invention in a position just at about the initial point of contact with a flexible sheet of material;

FIG. 2 is a side elevational view of the structure illustrated in FIG. 1, in a position at the point of full contact with a flexible sheet of material;

FIG. 3 is an enlarged side elevational view of a gripping device used in the embodiment of FIG. 1;

FIG. 4 is a partial side elevational view of a modification of the embodiment of FIG. 1;

FIG. 5 is a side elevational view of a still further embodiment of the invention, showing the apparatus making contact with a flexible sheet of material;

FIG. 6 is a side elevational view of the structure illustrated in FIG. 5, showing the apparatus in a sheet edge bending position;

FIG. 7 is an elevational sectional view of a gripping means employed in the invention;

FIG. 8 is a horizontal sectional view of the structure illustrated in FIG. 7, taken along the line 8—8 thereof and looking in the direction of the arrows;

FIG. 9 is an elevational sectional view of a further gripping means embodiment employed in the invention;

FIG. 10 is a still further gripping means embodiment employed in the invention; and,

FIG. 11 is a still further gripping means embodiment employed in the invention.

This application is a continuation-in-part of my prior co-pending application, Serial No. 581,424, filed on April 30, 1956 and entitled Sheet Material Separator and Handling Device, now U.S. Letters Patent No. 2,941,799.

FIGS. 1 through 3 disclose a first embodiment of the invention which includes a supporting means, as the longitudinal bar **105** which is provided with the lifting lugs **106** adapted for attachment to a suitable lifting or work transfer means, as a crane or the like. A downwardly sloping arm **107** is pivotally mounted at a point **108** on each end of the bar **105** at a point inwardly from the ends of the bar **105**. Each of the arms **107** has another arm **109** pivotally mounted on its lower end, as at **110**, and each of the arms **109** carries a gripping means **111**, or what could be called a pick-up unit. A chain or the like, as **112**, is connected to the arm **107** at the lower end thereof, and the upper end of the chain is connected to the outer end of the bar **105**, as at **113**. The chains **112** limit the downward swing of the arms **107** relative to the bar **105**. The bar **105** may be provided with additional holes, as **108***a*, for adjusting the position of the arms **107** to compensate for work sheets of varying sizes. The lengths of the chains **112** may be varied as needed.

As shown in FIG. 3, each of the gripping means **111** comprises a hollow body portion **111***a* which is provided with a tapered surface **114** on the lower outer corner thereof, from which extends a fixed suction cup as **115**. The suction cup **115** is adapted to be forced into an operable gripping engagement with a work sheet surface, by means of the weight of the gripping means forcing the air out therefrom. The chamber **114***a* of the suction cup **115** may have air admitted to it to break the suction through a conduit **114***b* which is adapted to be normally closed by the valve **116**. The valve **116** is fixedly mounted on the lower end of the rod **117** which has an enlarged head **118** on the upper end thereof, and which is slidably mounted through the end of a lever **119** mounted on the pivot **120**. The rod **117** may be slidably supported by any suitable means, as by the straps **117***a*. A spring **121** is mounted around the rod **117** between the head **118** and the lever **119** and tends to normally bias the lever **119** into the position shown in FIG. 3. A second spring **121***a* is mounted between the upper end of the head **118** and a suitable abutment, as **121***b*, and functions to bias the rod **117** downwardly to keep the valve **116** in a normally closed position. The right end of the lever **119**, as viewed in FIG. 3, carries a metallic clapper **122** which is adapted to be attracted to the electro-magnet **123** when said magnet is energized. The magnet **123** is swingably mounted in the body **111***a* and is provided with a vertical slot **124** which is adapted to receive the horizontal cross pin **125** for pivotally mounting the magnet in the body **111***a*. The outer upper corner **123***d* of the magnet **123** is rounded off so that the magnet will clear the clapper **122** when the gripping means is pivoted to permit engagement of the suction cup **115**. A pair of swingable pivot members

126 are pivotally mounted on the body 111*a* by means of the pivot pin 127, and the lower ends of the members 126 extend below the tapered body edge 114. The outer corner of the members 126 are rounded off as at 126*b* and form a fulcrum point about which the gripping means 111 pivots when it is lifted. A stop pin 126*c* is disposed adjacent each member 126 to limit its movement toward the suction cup 115.

A chain 128 depends from the medial point 141 on the supporting bar 105 and is connected at its lower end 129 to a weight 130 in which is suitably mounted an electro-magnet 131. The magnets 123 and 131 are connected by means of suitable conductors, as 132 and 133, respectively, to the circuit 134, which is connected to a suitable power source as 135. The circuit 134 is adapted to be energized by means of the micro-switch 136, the conductors 137 and the relay 138. The circuit 134 is adapted to be broken by means of the conductors 139 and the micro-switch 140.

In use, the embodiment of FIGS. 1 through 3 is adapted to be used only on ferrous metal sheets. The lifting lugs 106 would be attached to a suitable lifting means as a crane or other lifting or work transfer mechanism, and the separating apparatus would assume the position shown in FIG. 1, and when it contacts the surface of the sheet 27*c*, the end surface 123*b* of the magnets will engage the work surface and the gripping means 111 will pivot about the pins 125 in the magnet and the suction cups 115 will take a grip on the sheet 27*c*. The lifting means is then reversed and the edges of the sheet 27*c* will be peeled back, and as the peeling continues, the gripping means 111 will be pivoted relative to the magnet 123 by means of the slot 124 and the pin 125. The micro-switch 136 will be of a one-way type which will be operated as the lifting movement starts. That is, the arm 107 will engage the pivotally mounted leg 136*b* when the arm 107 moves from the position of FIG. 2 to that of FIG. 1. The leg 136*b* will abut the projection 136*d* and the switch actuator 136*c* will be cammed into action. When the arm 107 moves from the position of FIG. 1 to that of FIG. 2 the leg 136*b* will merely pivot out of the way of arm 107. The spring 136*e* would maintain the leg 136*b* in a normal inoperative position.

When the switch 136 is actuated by the arm 107, the magnets 123 and 131 will be energized and the clappers 122 will be attracted to the magnets 123. The lever 119 will be pivoted and the spring 121 will be compressed upwardly against the rod head 118 so as to force the rod upwardly enough to break open the valve 116 to admit air to the cups 115 and the suction cups 115 will be released and the work sheet will be gripped by the action of the magnets 123 and 131 alone. This action will straighten the sheet 27*c* again. The work position may be provided with a suitable stop or abutment positioned to operatively engage the micro-switch 140, whereby the relay 138 will be actuated to de-energize the circuit 134, and the magnets 123 and 131 will then release the sheet 27*c*, and the cycle may be repeated. In the embodiment of FIG. 1, only electric current for the electric magnets is required and no vacuum pump is required.

FIG. 4 discloses a modification of the embodiment of FIGS. 1 through 3. The structure and function of the parts are the same as the parts of the embodiment of FIGS. 1 through 3, but the arms 107*a* are pivoted at the center 141*a* of the lifting bar 105*a*, instead of at a point near each end of said bar. A further difference is that the weight 130*a* may be a plain weight without a magnet. If the weight 130*a* is not provided with a magnet, then the sheet 27*d* will not straighten out after the magnets 123*a* grip the sheet.

FIGS. 5 and 6 disclose a further embodiment of the invention which includes a supporting member 144 adapted to be affixed as at 145 to a suitable lifting means. Pivotally mounted on the lower end of the member 144, as at the point 146, are a pair of arms 23*c* and 32*c* which carry gripping means including the depending arms 24*c*

and 33*c* which are pivotally mounted thereon by the pins 25*c* and 34*c*, respectively. The arms 24*c* and 33*c* carry the suction cups 26*c* and 35*c* which are adapted to be exhausted of air through the conduits 29*c* and 37*c* by any suitable means.

Depending from the point 146 on the member 144 is an extension arm 149 adapted to carry a micro-switch 65*c* which functions to actuate a suitable control means for operating a suitable air operated vacuum pump. This embodiment would be provided with fluid means and electrical control means similar to the like equipment employed in the embodiments of the aforementioned copending parent application, for operating the suction cups 26*c* and 35*c*. The arms 23*c* and 32*c* are normally held in the position shown in FIG. 5 by means of the springs 151, which are mounted between an abutment 150 on each arm and the attachment member 144. The spring connections are indicated by the numerals 152 and 153. Each arm is provided with an integral projection 154 through which is threaded a stop screw 155 which abuts the attachment member 144 to limit the movement of the arms 23*c* and 32*c* upwardly, due to the action of springs 151.

The arms 23*c* and 32*c* are preferably made in two portions which are adjustable relative to each other to provide for handling work sheets of varying sizes. The numeral 32*d* indicates the outer end of the arm inner portion 32*f* which has a longitudinal slot 32*g* therein. The outer arm portion 32*e* is provided with a transverse screw 32*h* which is adapted to pass through slot 32*g* and be releasably locked therein by the nut 32*i*. The arm 23*c* is shown as having the same structure, and the numerals have similar subscripts.

In the use of the invention, this embodiment may be employed to lift the light weight sheets of any type material. The separating apparatus of FIG. 5 would be lowered onto a sheet to be lifted, in a position as shown in FIG. 5. When the control means, acting through the micro-switch 65*c* and an air operated vacuum pump, has caused the suction cups 26*c* and 35*c* to grip the sheet 27*e*, the lifting means will be moved upwardly and the sheet edges will be peeled upwardly as shown in FIG. 6 to break the adhesion effect between the sheet 27*e* and the next adjacent sheet. Continued lifting by the lifting means will carry the sheet away from the stack.

FIGS. 7 and 8 disclose a further gripping means embodiment which would be carried by the arms of the handling device in lieu of the previously described gripping means. The gripping means of FIGS. 7 and 8 comprises the cylindrical body generally indicated by the numeral 155 which is provided with the hollow interior 156. The lower end of the body 155 has a threaded hole 157 communicating with the interior 156 and threadably mounted in this hole is the valve member 158. The valve member 158 has a head 159 which is adapted to securely hold against the lower end of the body the conventional suction cup member 160. The valve member 160. The valve member 158 is provided with the hole therethrough 161 which communicates the interior 156 of the body with the inside of the suction cup 160.

The air conduit 161 is adapted to be normally closed by the ball valve 162 which is carried on the rod 163. The body 163 is provided with an enlarged head 164 which is normally biased downwardly by the spring 165, the upper end of which abuts against the cylinder head 166. The head 166 encloses the upper end of the hollow interior 156 and is fixedly secured to the body 155 as by means of the bolts 167. The cylinder head 166 is provided with the lug member 168 which has a hole 169 therethrough for hingedly connecting the gripping means to the carrying arm of the material handling device. It will be seen that when the gripping means is pushed into engagement with the surface of a piece of sheet material, that the suction member 160 will grip the piece of material in the normal manner and that the vac-

uum inside thereof will be sealed by the ball valve 162. When it is desired to release the suction member 160, the ball valve 162 may be lifted upwardly by energizing the solenoid coil 170 through the lead wires 171 which may be connected to any suitable source of electrical power. The energizing of the coil 170 will pull the enlarged head 164 upwardly since the metal head 164 acts as the armature for the solenoid. The movement upwardly of the solenoid armature 164 will raise the ball valve 162 to the dotted line position marked 172 whereby the atmospheric air will be permitted to pass into the interior 156 through the side opening 173 and through the conduit 161 and into the suction cup 160. The ball valve 162 may be lifted upwardly manually by means of the arm 174 which is pivoted on the pin 175 and which extends inwardly through the opening 173 in the side of the body 155. The inner end of the arm 174 extends inwardly through the opening 173 in the side of the body 155 and this inner end is fork-shaped as indicated by the numeral 176. The arm end 176 surrounds the rod 163 and it will be seen that when the arm 174 is pivoted counterclockwise as viewed in FIG. 7, that the inner end 176 will engage the solenoid armature 164 and raise the ball valve 162 from its seat to permit releasing action by the suction member 160. The outer part of the arm 174 may be provided with a suitable cam as 177 which may be operated by the hand of an operator or by a dog, or the like, on a machine. As previously stated the gripping means of FIGS. 7 and 8 would be carried on the arms 23*c* and 32*c* of the handling device of FIGS. 5 and 6, or on the arms 107 of the handling device of FIGS. 1 through 4.

FIG. 9 shows another embodiment of a gripping means adapted to be employed in the invention and which comprises a cylinder body 178 having an interior 179 which is enclosed on the upper end thereof by the cylinder head 180. The lower end of the cylinder body 178 is enclosed by a threadably mounted cylinder end member 181 which is adapted to carry a conventional suction cup member 182. The cylinder end member 181 is provided with a conduit 183 therethrough which communicates with the interior 179 of the body 178. The lower end 184 of the conduit 183 is threaded to provide a pipe coupling whereby the device may be used for providing a suction making and releasing means for a suction cup disposed at a distance from the body 178. Slidably mounted in the interior 179 is the piston 185 which is provided with suitable sealing means 186 which is normally biased upwardly by the spring 187. The piston 185 is fixedly connected to a piston rod 188 by means of a nut 189. The upper end of the piston rod 188 extends through the upper hole 189 formed in the upper cylinder head 180. A suitable O ring sealing means 190 is provided in the hole 189. A lifting lug 191 is mounted on the upper outer end of the cylinder rod 188 and includes the hole 192 for hingedly mounting the gripping means on the arms of a material handling device.

The gripping means further includes a second spring 193 which is disposed between the upper cylinder head 180 and the piston 185 and which coacts with the spring 187 which normally biases the piston 185 into an intermediate position in the cylinder 178. The upper end of the cylinder is adapted to be open to the atmosphere by means of the conduit fitting 194.

In use, the gripping means would be lowered into engagement with a piece of sheet material and when the suction cup 182 engage the material, piston 185 would be moved downwardly by means of the momentum of the handling device engaging material. The air in the cylinder would then be forced outwardly through the conduit 183 and out under the lip of the suction member 182 whereby a cleaning effect is created on the surface of the material under the suction cup. It will be seen that the air forced out of the suction cup in this manner will blow away any dirt or oil, etc., which may be disposed on the material surface being engaged by the suction cup.

The vacuum releasing means for the embodiment of FIG. 9 comprises a solenoid having the coil 195 which is mounted in a separate compartment 196 carried on the side of the body 178. The solenoid further includes the armature 197 which carries the ball valve 198 for normally closing the conduit 199. The spring 200 normally urges the armature 197 downwardly to keep the ball valve 198 in a normally closed position. The conduit 199 is connected to a passage 201 in the cylinder end member 181 and passage 201 is connected to the conduit 183 leading into the suction cup 182. The conduit 202 which is similar to 199 is connected at the diametrical opposite side of the body 178 to a conduit 203 which is also connected to the conduit 183 in the cylinder end member 181.

The outer end of the conduit 202 is attached to a vacuum switch generally indicated by the numeral 204. The switch 204 includes a diaphragm 205 which is adapted to operate normally closed or open contacts 206, as desired. The vacuum switch 204 is adapted to show that the vacuum and suction cup is working properly. The spring 207 normally biases the diaphragm upwardly into an operative position. The contacts as 206 would be connected to any suitable signal light or other operating mechanism in the lifting device. The diaphragm 205 may be manually pushed down by means of the rod 208 to check the operation of the signal light. The passages 203 and 201 connecting the vacuum switch 204 and the vacuum release valve 209 are normally closed by means of the ball check valves 210 and 211 which are normally biased to the closed position against their respective valve seats by the spring 212.

When it is desired to release the material held by the suction cup 182, the operator may release the vaccum from the cup by lifting upwardly on the solenoid manual release button 213 or by electrically energizing solenoid coil 195 to raise ball valve 198 to open the conduit 199 whereby atmospheric air pressure would be forced in the inlet 214 and through the conduit 199 and into the passage 201. The air pressure will force the ball 211 off of its seat to permit the air to pass through the conduit 183 and into the suction cup 182 to release the material. The suction cup 182 may also be released by inserting air under pressure through conduit 194 to move the piston 185 downwardly.

FIG. 10 illustrates a further gripping means embodiment of the invention which is constructed in the same manner as the embodiment of FIG. 9 and the correspond structural parts are marked with similar reference numerals followed by the small letter *"a."* The main difference between the embodiments of FIGS. 9 and 10 is that the piston 185*a* is operated upwardly and downwardly by air pressure instead of spring pressure. The piston 185*a* is forced downwardly by means of air pressure fed into cylinder 178*a* by means of the inlet 215. A separate cylinder 216 is fixedly mounted on top of the cylinder end 180*a*. The cylinder 216 includes the hollow interior 217 in which is slidably mounted the piston 218 to which is fixedly mounted the upper end of the piston rod 188*a* by means of the nut 219.

The piston 185*a* is forced upwardly by means of air pressure fed into the cylinder 217 through the inlet 220. The air in the upper end of the cylinder interior 217 is adapted to be exhausted to the atmosphere by means of the opening 221. The gripping means is provided with the lug 222 having the hole 223 therethrough for hingedly mounting the gripping means on the arms of the materials handling device. It will be seen that the gripping means of FIG. 10 includes the vacuum switch 204*a* and a vacuum release valve means as 209*a* which operates in the same manner as the corresponding structure previously described for FIG. 9.

FIG. 11 illustrates generally a valve and piston means which may be constructed in the same manner as shown in detail in FIG. 10 and which is generally illustrated by

the numeral 224. The cylinder 224 is provided with an outlet pipe 225 which is adapted to be threadably mounted in the pipe thread 184*a*. Fixedly mounted on the pipe 225 in any suitable manner is the conduit 226 which may be connected to the vacuum line 227 of a remotely located conventional suction cup holding means 228. The cylinder 224 includes all of the novel structure of the gripping means shown in FIG. 10, and it is especially adapted to be used in lifting devices in my aforementioned co-pending application, and especially similar to the vacuum device shown in the FIG. 1 thereof.

Another novel way of using my gripping means invention is to mount the body or the cylinder thereof horizontally or vertically on a movable or stationary platform and have the piston 185 actuated back and forth by an external reciprocating device such as a crank, a cam or a fluid mechanism to provide a structure such as shown in my aforementioned application in FIG. 1 by the numerals 51, 52, 53, 54, 56, 29 and 26. For FIG. 10 of my new gripping means invention no external reciprocator is needed when used as in FIG. 11.

While it will be apparent that the preferred embodiments of the invention herein disclosed are well calculated to fulfill the objects above stated, it will be appreciated that the invention is susceptible to modification, variation and change without departing from the proper scope or fair meaning of the subjoined claims.

What I claim is:

1. A sheet material separating and handling apparatus of the class described, comprising: a supporting means; attaching means for securing said supporting means to a lifting means; a pair of laterally spaced apart arms carried by said supporting means and adapted for movement relative to said supporting means; a gripping means freely pivotally mounted on each of said arms for releasably gripping an opposite pair of edges on the top surface of a flexible sheet of material on a stack of sheet material, whereby when the lifting means lifts said supporting means, said gripping means will pivot relative to said supporting means and said opposite pair of edges will be peeled upwardly to break the adhesion effect between said sheet and the next adjacent sheet; one of said arms being pivotally mounted on said supporting means inwardly from one end thereof, and the other of said arms being pivotally mounted on said supporting means inwardly from the other end thereof; means for limiting the pivotal movements of said arms relative to said supporting means; and, a weight suspended from the medial point of said supporting means for engaging the sheet of material.

2. A sheet material separating and handling apparatus of the class described, comprising: a supporting means; attaching means for securing said supporting means to a lifting means; a pair of laterally spaced apart arms carried by said supporting means and adapted for movement relative to said supporting means; a gripping means freely pivotally mounted on each of said arms for releasably gripping an opposite pair of edges on the top surface of a flexible sheet of material on a stack of sheet material, whereby when the lifting means lifts said supporting means, said gripping means will pivot relative to said supporting means and said opposite pair of edges will be peeled upwardly to break the adhesion effect between said sheet and the next adjacent sheet; the inner ends of said pair of arms being pivotally mounted on said supporting means at the medial point thereof; and, a weight suspended from the medial point of said supporting means for engaging the sheet of material.

3. A sheet material separating and handling apparatus of the class described, comprising: a supporting means; attaching means for securing said supporting means to a lifting means; a pair of laterally spaced apart arms carried by said supporting means and adapted for movement relative to said supporting means; a gripping means freely pivotally mounted on each of said arms for releasably gripping an opposite pair of edges on the top surface of a flexible sheet of material on a stack of sheet material; whereby when the lifting means lifts said supporting means, said gripping means will pivot relative to said supporting means and said opposite pair of edges will be peeled upwardly to break the adhesion effect between said sheet and the next adjacent sheet; one of said arms being pivotally mounted on said supporting means inwardly from one end thereof, and the other of said arms being pivotally mounted on said supporting means inwardly from the other end thereof; means for limiting the pivotal movementcs of said arms relative to said supporting means; a weight suspended from the medial point of said supporting means for engaging the sheet of material; each of said gripping means having a suction cup element thereon for gripping the surface of the sheet of material; an electro-magnet pivotally mounted on each of said gripping means; and, means for releasing the suction elements from the sheet when said apparatus is lifted by the lifting means and for energizing said electro-magnets, whereby said magnets will grip said sheet of material.

4. A sheet material separating and handling apparatus of the class described, comprising: a supporting means; attaching means for securing said supporting means to a lifting means; a pair of laterally spaced apart arms carried by said supporting means and adapted for movement relative to said supporting means; a gripping means freely pivotally mounted on each of said arms for releasably gripping an opposite pair of edges on the top surface of a flexible sheet of material on a stack of sheet material, whereby when the lifting means lifts said supporting means, said gripping means will pivot relative to said supporting means and said opposite pair of edges will be peeled upwardly to break the adhesion effect between said sheet and the next adjacent sheet; the inner ends of said pair of arms being pivotally mounted on said supporting means at the medial point thereof; a weight suspended from the medial point of said supporting means for engaging the sheet of material; each of said gripping means having a suction element thereon for gripping the surface of the sheet of material; a pivotally mounted electro-magnet on each of said gripping means; and, means for releasing the suction elements from the sheet when said apparatus is lifted by the lifting means and for energizing said electro-magnets, whereby said magnets will grip said sheet of material.

5. A sheet material separating and handling apparatus of the class described, comprising: a supporting means; attaching means for securing said supporting means to a lifting means; a pair of laterally spaced apart arms carried by said supporting means and adapted for movement relative to said supporting means; a gripping means freely pivotally mounted on each of said arms for free pivotal movement by gravity for releasably gripping an opposite pair of edges on the top surafce of a flexible sheet of material on a stack of sheet material, whereby, when the lifting means lifts said supporting means, said gripping means will pivot relative to said supporting means and said opposite pair of edges will be peeled upwardly to break the adhesion effect between said sheet and the next adjacent sheet; and said arms are pivotally mounted on said supporting means.

6. The invention as defined in claim 5, wherein: said arms are adjustable to various lengths.

7. The invention as defined in claim 5, wherein: said gripping means is provided with a piston for providing a vacuum therein; and, means for releasing the vacuum therein.

8. The invention as defined in claim 7, wherein: said piston is pressure fluid operated.

9. The invention as defined in claim 7, wherein: said piston is spring biased in each direction.

10. The invention as defined in claim 5, wherein said gripping means is provided with a suction cup and a conduit leading into said cup, and a valve adapted to

normally block said conduit, and means for moving said valve to open said conduit.

11. A sheet material separating and handling apparatus of the class described, comprising: a supporting means; attaching means for securing said supporting means to a lifting means; a pair of laterally spaced apart arms carried by said supporting means and adapted for movement relative to said supporting means; a gripping means freely pivotally mounted on each of said arms for releasably gripping an opposite pair of edges on the top surface of a flexible sheet of material on a stack of sheet material; whereby when the lifting means lifts said supporting means, said gripping means will pivot relative to said supporting means and said opposite pair of edges will be peeled upwardly to break the adhesion effect between said sheet and the next adjacent sheet; one of said arms being pivotally mounted on said supporting means inwardly from one end thereof, and the other of said arms being pivotally mounted on said supporting means inwardly from the other end thereof; means for limiting the pivotal movements of said arms relative to said supporting means; a weight suspended from the medial point of said supporting means for engaging the sheet of material; each of said gripping means having a suction cup element thereon for gripping the surface of the sheet of material; an electro-magnet pivotally mounted on each of said gripping means; means for releasing the suction elements from the sheet when said apparatus is lifted by the lifting means and for energizing said electro-magnets, whereby said magnets will grip said sheet of material; and, said weight being provided with an electro-magnet which is electrically connected to operate when said electro-magnets on said gripping means are energized.

12. A sheet material separating and handling apparatus of the class described, comprising: a supporting means; attaching means for securing said supporting means to a lifting means; a pair of laterally spaced apart arms carried by said supporting means and adapted for movement relative to said supporting means; a gripping means freely pivotally mounted on each of said arms for releasably gripping an opposite pair of edges on the top surface of a flexible sheet of material on a stack of sheet material, whereby when the lifting means lifts said supporting means, said gripping means will pivot relative to said supporting means and said opposite pair of edges will

be peeled upwardly to break the adhesion effect between said sheet and the next adjacent sheet; the inner ends of said pair of arms being pivotally mounted on said supporting means at the medial point thereof; a weight suspended from the medial point of said supporting means for engaging the sheet of material; each of said gripping means having a suction element thereon for gripping the surface of the sheet of material; a pivotally mounted electro-magnet on each of said gripping means; means for releasing the suction elements from the sheet when said apparatus is lifted by the lifting means and for energizing said electro-magnets, whereby said magnets will grip said sheet of material; and, said weight being provided with an electro-magnet which is electrically connected to operate when said electro-magnets on said gripping means are energized.

13. A sheet material separating and handling apparatus of the class described, comprising: a supporting means; attaching means for securing said supporting means to a lifting means; a pair of spaced apart gripping means freely pivotally mounted on said supporting means; spring means for maintaining said gripping means perpendicular to the top surface of a flexible sheet of material on a stack of sheet material, whereby when the lifting means lifts said supporting means said gripping means will pivot relative to said supporting means and an opposite pair of edges of the sheet of material will be peeled upwardly to break the adhesion effect between said sheet and the next adjacent sheet; and, a weight suspended from the medial point of said supporting means for engaging the sheet of material.

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