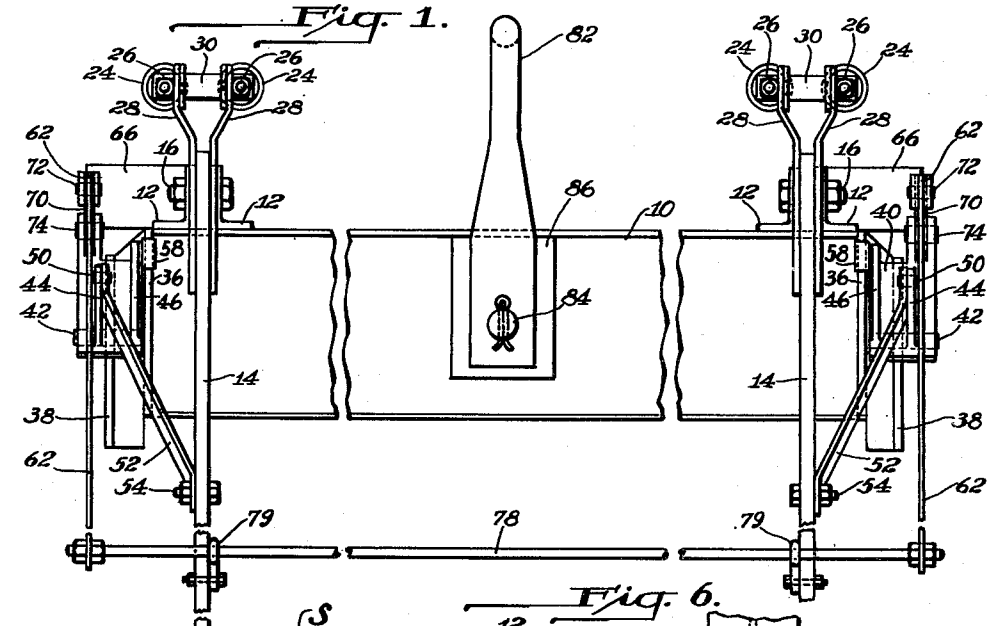
Feb. 1, 1938. H. H. SCHMID 2,107,189

SHEET CARRIER

Filed March 4, 1936 2 Sheets-Sheet 1

Fig. 1.



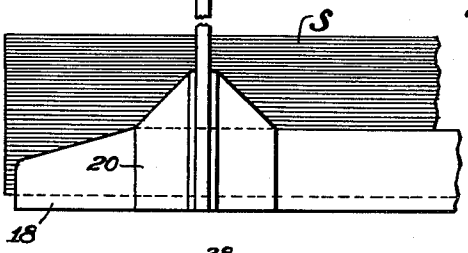


Fig. 6.

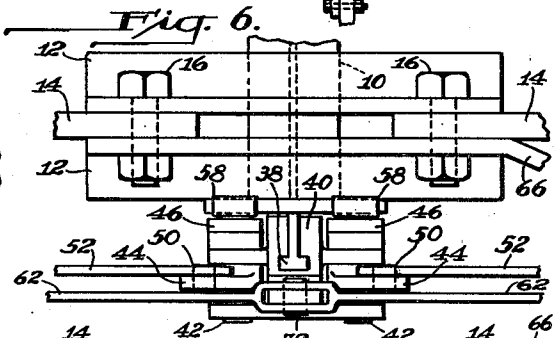


Fig. 5.

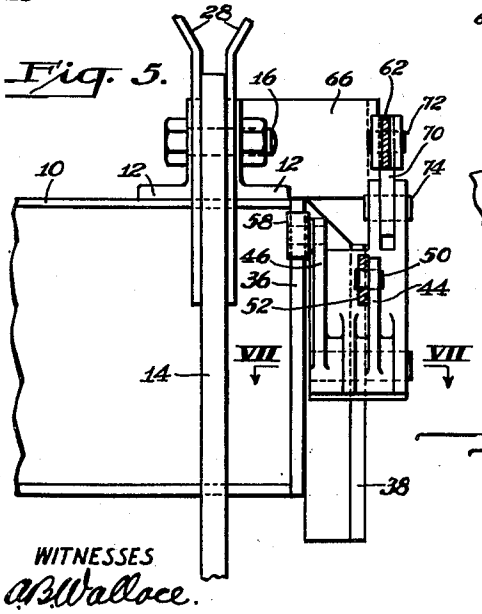
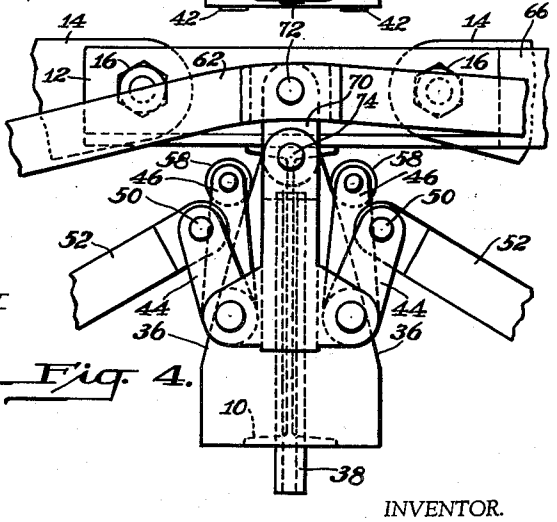


Fig. 4.



WITNESSES

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SHEET CARRIER

Filed March 4, 1936 2 Sheets-Sheet 2

Fig. 2.

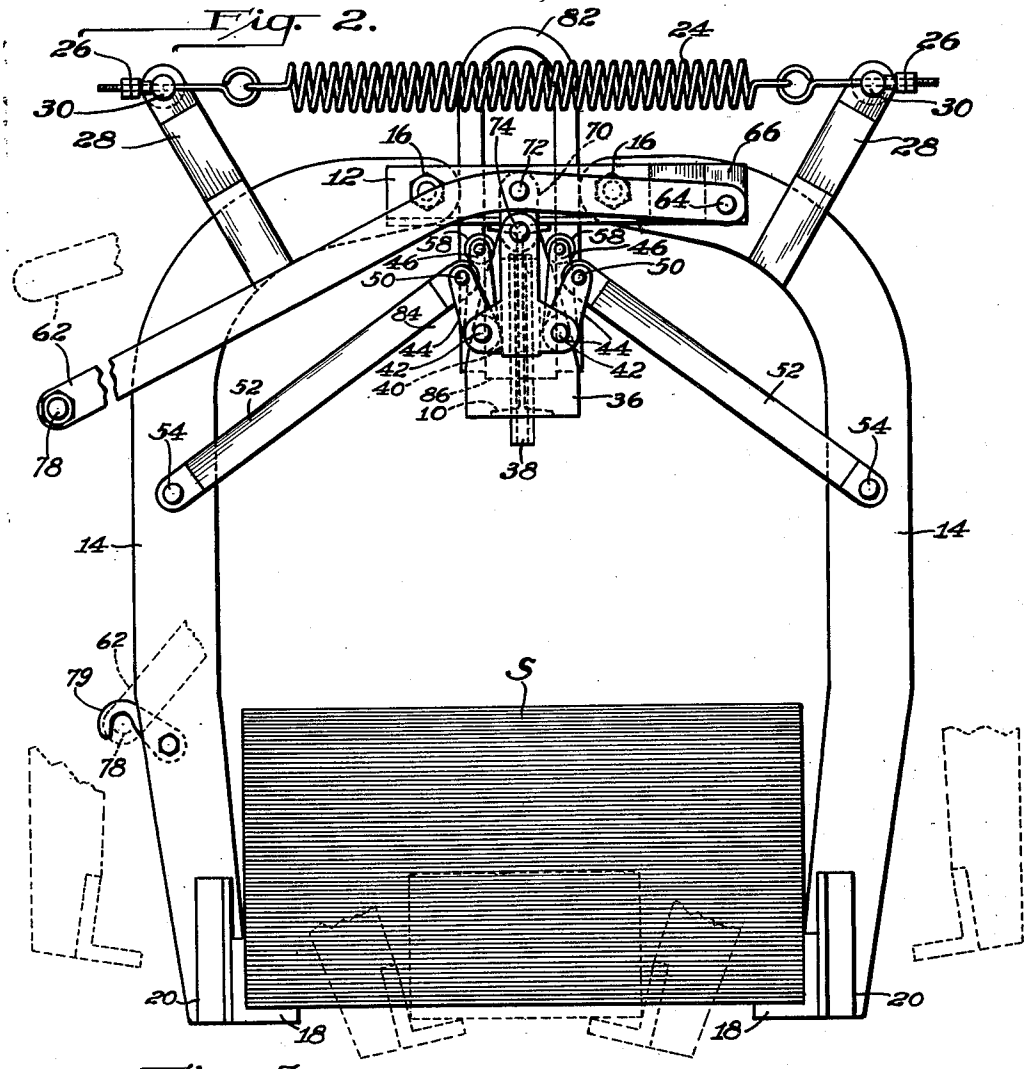


Fig. 7.

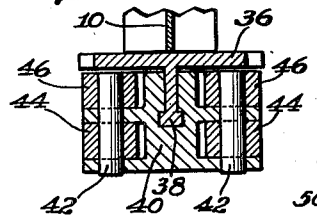
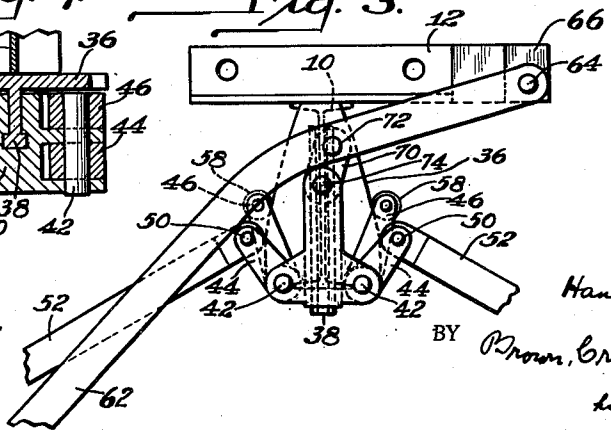


Fig. 3.



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UNITED STATES PATENT OFFICE

2,107,189

SHEET CARRIER

Hans H. Schmid, Mars, Pa., assignor to United Engineering & Foundry Company, Pittsburgh, Pa., a corporation of Pennsylvania

Application March 4, 1936, Serial No. 67,084

15 Claims. (Cl. 294—116)

This invention relates to a mechanism for handling sheet material and more particularly to a carrier for piled metal sheets or the like.

Heretofore apparatus of the general type indicated has been open to the objection that if the parts were hand operated to clutch and release the metal sheets, different sizes of sheets could only be handled with difficulty. This was because the handling of relatively wide or narrow sheets necessitated the parts of the apparatus to operate in difficult and acutely angular positions. In view of this and other complications, power means have been used to operate sheet carriers, which is undesirable due to initial, upkeep, and operating costs.

It is the general object of the invention to overcome and avoid the foregoing and other difficulties of known devices by the provision of an improved carrier for sheets which is sturdy, relatively inexpensive, of simple construction, and easily operated.

Another object of the invention is to provide a sheet carrier adapted to handle sheets of various widths with the mechanism of the carrier functioning with the same ease and sureness regardless of the width of the sheets handled.

Another object of the invention is the provision of sheet handling apparatus having movable sheet-engaging jaws which are operated by a combined toggle and cam mechanism.

The foregoing and other objects of the invention are achieved by apparatus including a pair of jaw members and means mounting the jaw members for movement toward and from each other. A toggle linkage of novel design is provided for controlling the position of the jaw members and associated therewith are cam means for increasing the effective length of the linkage as the jaws are moved apart and decreasing the effective length of the linkage when the jaws are moved together. Thus the force required to operate the linkage is substantially constant regardless of the distance between the jaws.

In the accompanying drawings, Fig. 1 is a side elevation, partly broken away, of one typical form of apparatus embodying the principles of the invention; Fig. 2 is an end view of the apparatus shown in Fig. 1, but on a somewhat larger scale; Fig. 3 is an enlarged view of the cam and block mechanism shown as a part of Fig. 2; Fig. 4 is a view similar to Fig. 3 but with the parts in another position; Fig. 5 is an enlarged view of a portion of Fig. 1 illustrating in greater detail the construction of the cam and block mechanism; Fig. 6 is a plan view of the cam and block mechanism illustrated in Figs. 4 and 5; and Fig. 7 is a cross sectional view taken on line VII—VII of Fig. 5.

In the embodiment of the invention illustrated in the drawings, the numeral 10 indicates a frame member, usually in the form of an I-beam, to which are secured transversely extending angle irons 12, positioned in pairs at the ends of the I-beam. The angle irons 12 are spaced a sufficient distance apart so as to receive the ends of inverted L-shaped arms 14, which are pivotally secured to the angle irons as by bolts 16. The lower ends of the arms 14 are secured to angle iron jaws 18 by brackets 20, so that, as seen from Figs. 1 and 2, the movement of the arms 14 toward and from each other can cause the jaws 18 to engage below the edges of a pile of sheets marked "S".

Normally the weight of the jaws 18 and the arms 14 is counterbalanced and, in the form of the invention illustrated, means to accomplish this purpose comprise springs 24 which are secured by take-up bolts 26 to bracket arms 28 through pivotal connections 30, as shown in Figs. 1 and 2.

The mechanism for controlling the position of the arms 14 and jaws 18 is duplicated on each end of the I-beam frame 10 and accordingly only one such mechanism will be described in detail. As best seen in Fig. 5, a cam plate 36 is welded or otherwise secured to the end of the I-beam 10 and is formed with an outwardly extending rib 38 which slidably carries a block 40 for vertical movement. The block 40 as shown in Fig. 7 pivotally supports pins 42, to each of which is fixed a set of lever arms 44 and 46. It will be recognized that since the levers 44 and 46 of each set are fixed to the same pin 42 a bell crank is substantially provided. The lever arms 44 are pivotally secured, as at 50, to toggle links 52, which are in turn pivotally secured, as at 54, to the arms 14. Thus the bell cranks are in effect fastening means securing the toggle links 52 to the block 40. Levers 46 rotatably support rollers 58, which engage with the cam surfaces of cam plate 36, as will be evident from a consideration of Figs. 4, 5, and 6. The links 52 together comprise a toggle and the block 40 and associated bell crank mechanism provide a knuckle joint at the center of the toggle against which force is applied to operate the jaws as hereinafter described.

The vertical position of the block 40 is controlled by a lever 62, which is pivotally secured, as at 64, to an extension 66 formed on the end-

most angle iron 12. The lever 62 is secured to the block 40 by a link 70, pivotally secured at 72 to the lever, and at 74 to the block. The ends of the levers 62 at the opposite ends of the framework are connected together by a rod 78 so that they may be operated simultaneously. One or more latches 79 may be pivotally secured to the arms 14 which can be engaged with the rod 78 to hold the jaws 18 in an open position to facilitate operations. For convenience, in Fig. 2 of the drawings, the latches 79 have been illustrated as locked with the rod 78 although the arms 14 are not in their fully open position. Actually the locking mechanism is normally adapted to be positioned for operation when the arms are fully opened.

Any suitable means are provided for facilitating the pickup of the carrier and in the embodiment of the invention shown these means include an inverted U-shaped hook 82 which is pivotally secured by a pin 84 to the central portion of the I-beam frame 10 with a strengthening plate 86 normally being welded to the I-beam frame to receive the pin 84.

In the operation of the apparatus just described, when it is desired to pick up a pile of sheets "S", the carrier, generally supported by an overhead crane secured to the hook 82, is slowly lowered down over the pile of sheets with the I-beam frame 10 in line with the length of the sheets. The operating levers 62, through their connecting rod 78, are simultaneously pushed down to expand the arms 14 and the angle iron jaws 18, so that they clear the edges of the pile. The latches 79 may be dropped over the rod 78 to facilitate holding the jaws in an open position. It will be seen that movement of the operating rod 78 downwardly causes the blocks 40 to move downwardly on the ribs 38, and provide a toggle action on the links 52 to move the arms 14 and jaws 18 apart. In addition, however, as the toggle action is taking place, the rollers 58 ride downwardly and outwardly on the surfaces of the cam plates 36. This rocks the shafts 42 and turns the levers 44 outwardly so as to increase the effective length of links 52 to further, but simultaneously, move the arms 14 and jaws 18 apart. The cam action just described might be said to change the point of pivotal connection between the links 52 and the block 40. The change of position of the parts is well illustrated in Figs. 3 and 4, which show, respectively, the mechanism in positions where the jaws 18 are completely apart and completely together.

Once the jaws 18, carried by the arms 14, have cleared the sheet pile and are below it, they are moved beneath the pile, which is usually supported upon centrally positioned supporting platforms or planks. The jaws 18 are moved into position beneath the pile by releasing the latches 79 and operating the rod 78 to move the levers 62 upwardly, which in turn move blocks 40 upwardly and reverse the operation of the mechanism described just above.

The sheet pile is now ready to be picked up and the lifting of the I-beam frame 10 through hook 82 causes the arms 14 to tend to pivot about bolts 16 thereby holding the jaws 18 tightly against the pile so long as the pile is carried. When the pile of sheets is set down upon a platform and the tension on the hook 82 is released, the operating rod 78 is forced in a downward direction to open the jaws 18 as heretofore described and with the handle manually held in its downward position or with the latches 79 again engaged with the rod 78, the sheet carrier can be readily picked up again by the crane without lifting the pile. Holding the operating handle in, or moving it to, its downward position is facilitated because the springs 24 substantially counterbalance the weight of the arms 14 and their associated structure.

The particular advantage of the sheet carrier herein described and illustrated is that it is adapted to handle sheets of very considerable difference in weight and particularly widths. For example, sheets from 22" to 72" in width can be readily carried by a single size of carrier constructed as just described. This is largely due to the fact that the toggle linkage connecting the operating levers 62 with the arms 14 is of adjustable length or is aided by cam action. It will be seen that, when the carrier is employed with sheets of relatively small width as, for example, illustrated in dotted lines in Fig. 2, the blocks 40 are moved to an upper position, at which time the rollers 58 carried by levers 46 engage with a narrow portion of the cam plates 36. This in turn causes the levers 44 to assume the position shown in Fig. 4 so that the effective length of links 52 is reduced. However, when it is desired to release the small pack or pile of sheets, a downward movement of the levers 62 through operating rod 78 causes positive outward movement of the jaws 18 carried by the arms 14. This is due, not only to the usual toggle action of links 52, but also to the fact that the blocks 40 move downwardly on ribs 38, which forces the rollers 58 to a wider portion of the cam plates 36, turns the levers 44 on the shafts 42, and moves the links 52 outwardly, thereby increasing their effective length.

Thus in the present invention a combined toggle and cam action is provided for operation of the clutch and release of the carrier.

More particularly, the operation between the rollers 58 and associated levers and the cam plates 36 results in an apparatus which can effectively handle sheet piles of various widths without appreciably altering the force required to move the operating rod 78. In prior structures, the force required to move the operating mechanism might be within required limits when certain sizes of sheet were carried. However when larger or smaller sizes were carried, the position of the operating mechanism was often such that it was impossible for a man to operate the carrier.

From the foregoing it will be recognized that the objects of the invention have been achieved by the provision of an improved sheet carrier adapted to handle sheets of various sizes. The actual force required to operate the carrier mechanism is substantially constant over a wide variety of sheet sizes and moreover is considerably below forces heretofore required on known structures, which is highly desirable. The structure herein described is relatively simple, sturdy, and foolproof, and is particularly adapted to commercial production work.

While in accordance with patent statutes one embodiment of the invention has been illustrated and described in detail, it should be understood that the invention is not limited thereto or thereby but is defined in the appended claims.

I claim:

1. A carrier for metal sheets or the like comprising a frame member, a pair of arms pivotally secured thereto adjacent each end, sheet engaging jaws connecting the arms on each side

of the frame member, means counterbalancing the weight of the arms, and a combined cam and toggle mechanism for controlling the position of the jaws, said mechanism including a block slidably mounted in the frame member, an operating handle for controlling the position of the block, a latch for holding the operating handle in one position, a pair of bell crank means pivotally mounted on the block, toggle links pivotally connecting the arms to one side of each of the bell crank means, and a cam plate on the frame member, with the other side of each of the bell crank means engaging with the cam plate.

2. A carrier for metal sheets or the like comprising a frame member, a pair of arms pivotally secured thereto, sheet engaging jaws on the arms, and a combined cam and toggle mechanism for controlling the position of the jaws, said mechanism including a block slidably mounted in the frame member, an operating handle for controlling the position of the block, a pair of bell crank means pivotally mounted on the block, toggle links pivotally connecting the arms to one side of each of the bell crank means, and a cam plate on the frame member, with the other side of each of the bell crank means engaging with the cam plate.

3. A carrier for metal sheets or the like comprising a frame member, a pair of arms movably carried thereby, sheet engaging jaws mounted on the arms, means counterbalancing the weight of the arms, and a combined cam and toggle mechanism for controlling the position of the jaws, said mechanism including a block slidably mounted in the frame member, an operating handle for controlling the position of the block, a pair of bell cranks pivotally mounted on the block, toggle links pivotally connecting the arms to one side of each of the bell cranks, and a cam plate on the frame member, with the other side of each of the bell cranks engaging with the cam plate.

4. A carrier for metal sheets or the like comprising a frame member, a pair of arms mounted thereon, sheet engaging jaws carried by the arms, toggle mechanism for controlling the position of the jaws, means for positively controlling the position of the toggle mechanism, and cam mechanism actuated by the last-named means and operating through the toggle mechanism for changing the position of the jaws simultaneously with any change of the position of the jaws as effected by the toggle mechanism.

5. A carrier for metal sheets or the like comprising a frame member, a pair of arms mounted thereon, sheet engaging jaws carried by the arms, a toggle mechanism for positively moving the jaws to and from each other, means for controlling the position of the toggle mechanism and cam means actuated by the last-named means and operating through the toggle mechanism for changing the position of the jaws simultaneously with any change effected by the toggle mechanism, and means for locking the jaws in an open position.

6. A sheet pile carrier comprising a frame, a pair of jaw members, means pivotally mounting the jaw members on the frame for movement toward and from each other, a toggle linkage for positively controlling movement of the jaw members to and from each other and cam means for increasing the effective length of the linkage as the jaws are moved apart and decreasing the effective length of the linkage when the jaws are moved together, whereby the force required to operate the linkage is substantially constant regardless of the distance between the jaws.

7. A sheet pile carrier comprising a pair of jaw members, means mounting the jaw members for movement toward and from each other, a toggle linkage for controlling the position of the jaw members and cam means for increasing the effective length of the linkage as the jaws are moved apart and decreasing the effective length of the linkage when the jaws are moved together, said cam means changing the points of relative pivotal connection of certain of the toggle linkage.

8. An apparatus for carrying sheets comprising a frame, a pair of jaws, inverted L-shaped arms supporting the jaws and pivotally secured to the frame so that when it is raised the jaws move together, springs counterbalancing the weight of the jaws and arms, a block slidably carried at each end of the frame for vertical movement therein, a double pair of levers pivotally carried by each block, a plurality of links, each one of which is pivotally secured to an arm at one end and at its other to one lever of a pair of levers, a cam plate mounted on the frame adjacent each block, a roller carried by the other lever of each pair and engaging with the cam plate, and means for simultaneously controlling the position of the blocks in the frame.

9. An apparatus for carrying sheets comprising a frame, a pair of jaws, arms supporting the jaws and pivotally secured to the frame, springs counterbalancing the weight of the jaws and arms, a block slidably carried at each end of the frame for vertical movement, a double set of levers pivotally carried by each block, a plurality of links, each one of which is pivotally secured to an arm at one end and at its other to one lever of a set of levers, a cam plate mounted on the frame adjacent each block, a roller carried by the other lever of each set and engaging with the cam plate, and means for controlling the position of the blocks in the frame.

10. An apparatus for carrying sheets comprising a frame, a pair of jaws, arms supporting the jaws on the frame, a block slidably carried at each end of the frame for vertical movement thereon, a double pair of levers pivotally carried by each block, a plurality of links, each one of which is pivotally secured to an arm at one end and at its other to one lever of a pair of levers, a cam plate mounted on the frame adjacent each block, a roller carried by the other lever of each pair and engaging with the cam plate, and means for simultaneously controlling the position of the blocks in the frame.

11. An apparatus for carrying sheets comprising a frame, a pair of jaws, arms supporting the jaws on the frame, a block slidably carried at each end of the frame for vertical movement thereon, a double pair of levers pivotally carried by each block, a plurality of links, each one of which is pivotally secured to an arm at one end and at its other to one lever of a pair of levers, a cam plate mounted on the frame adjacent each block, a roller carried by the other lever of each pair and engaging with the cam plate, means for simultaneously controlling the position of the blocks in the frame, and means for locking the blocks against movement when the jaws are in an open position.

12. A sheet pile pickup comprising a pair of jaws, a frame pivotally mounting the jaws for movement to and from each other, links pivotally secured to the jaws, a block, fastening

means pivotally securing the other ends of the links to the block, means mounting the block for movement in the frame, means for controlling the position of the block in the frame, and means controlled by the position of the block for changing the angular relation of the fastening means with the block and with the links whereby substantially the same force will move the jaws to and from each other regardless of the distance between the jaws.

13. A sheet pile pickup comprising a pair of jaws, a frame mounting the jaws for movement to and from each other, links pivotally secured to the jaws, a block, fastening means pivotally securing the other end of the links to the block, means mounting the block for movement in the frame, means for controlling the position of the block in the frame, and means controlled by the position of the block for changing the relation of the fastening means with the block and with the links.

14. Apparatus for carrying piles of sheets and the like comprising a frame, a pair of jaws pivotally secured to the frame for movement toward and from each other, a toggle link pivotally secured to each jaw, a knuckle joint pivotally securing the toggle links together, and means for applying force to the knuckle joint to move the jaws toward and from each other, said knuckle joint including mechanism for increasing the effective length of the toggle links as the jaws are moved apart and for decreasing the effective length of the toggle links as the jaws are moved together so that regardless of the distance between the jaws substantially the same force on the means for applying force to the knuckle joint will move the jaws.

15. Apparatus for carrying piles of sheets and the like comprising a frame, a pair of jaws mounted on the frame for movement toward and from each other, a toggle link pivotally secured to each jaw, a knuckle joint pivotally securing the toggle links together, and means for applying force to the knuckle joint to move the jaws toward and from each other, said knuckle joint including mechanism for increasing the effective length of the toggle links as the jaws are moved apart and for decreasing the effective length of the toggle links as the jaws are moved together so that regardless of the distance between the jaws substantially the same force on the means for applying force to the knuckle joint will move the jaws.

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