May 28, 1957 E. W. MENK 2,793,693

TAKE-OFF EQUIPMENT FOR PLATE SHEARS

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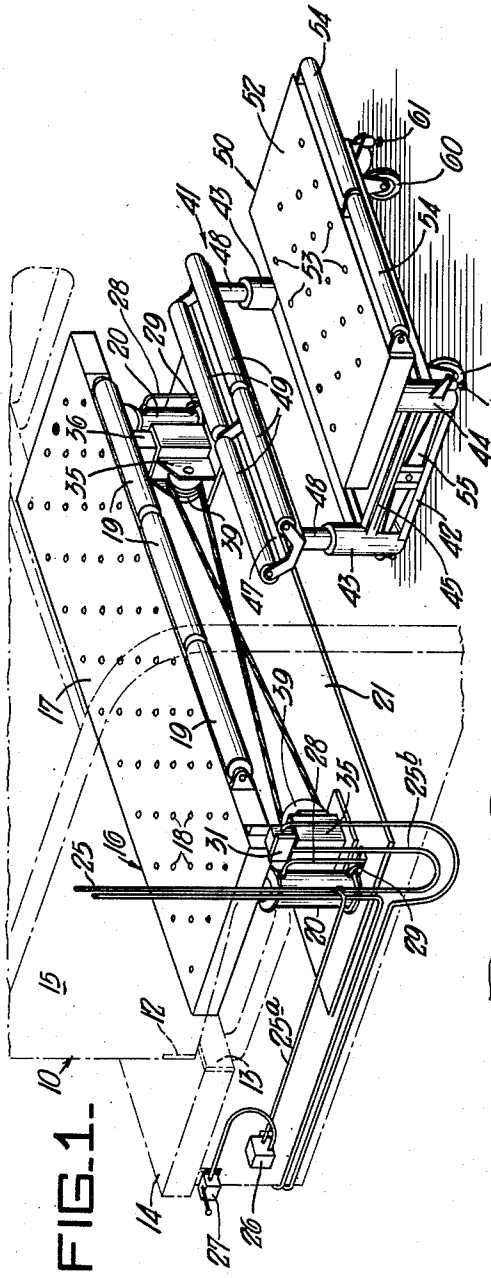


FIG. 1.

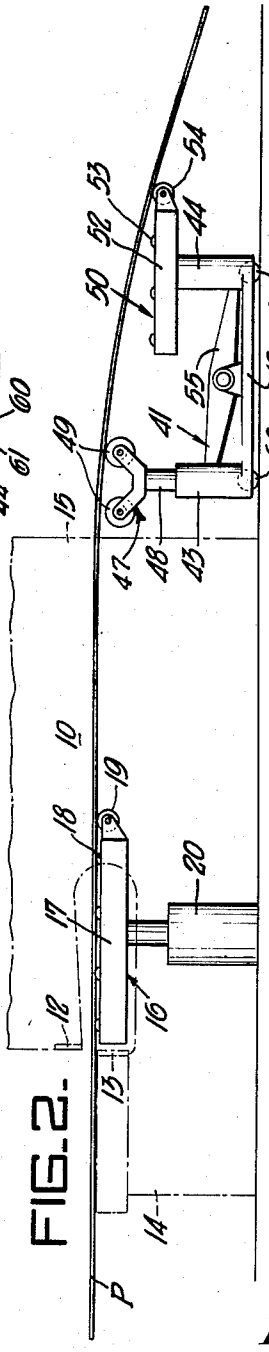


FIG. 2.

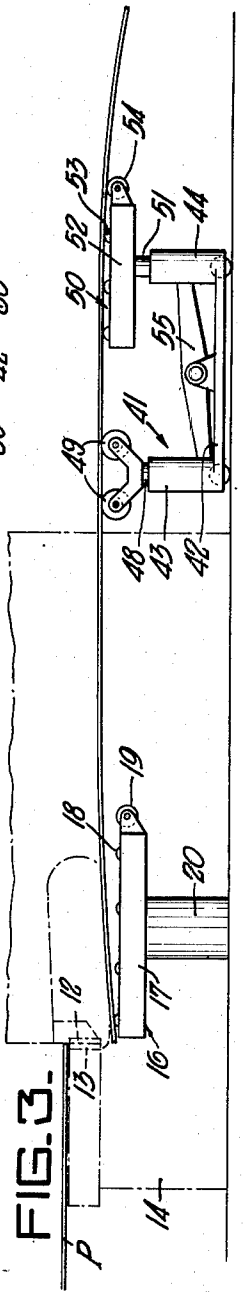


FIG. 3.

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TAKE-OFF EQUIPMENT FOR PLATE SHEARS

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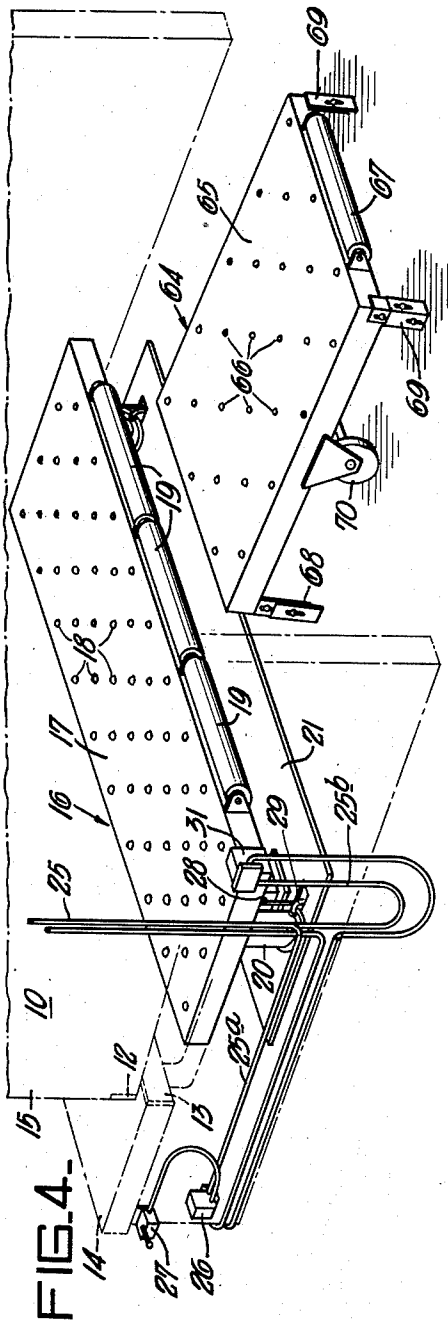


FIG. 4.

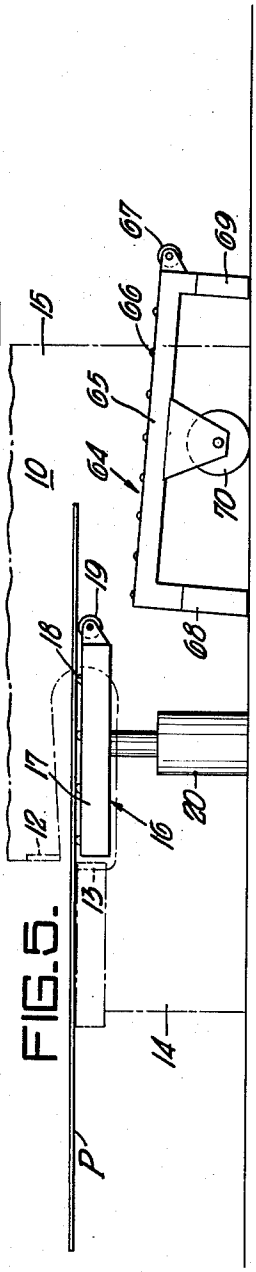


FIG. 5.

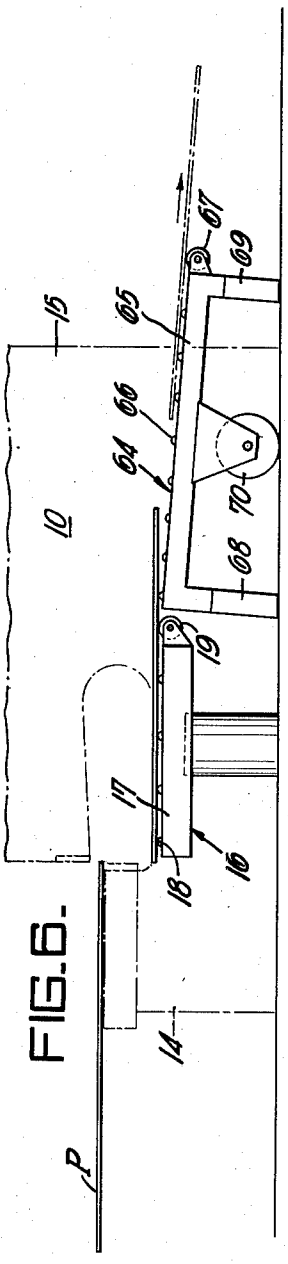


FIG. 6.

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TAKE-OFF EQUIPMENT FOR PLATE SHEARS

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FIG. 7.

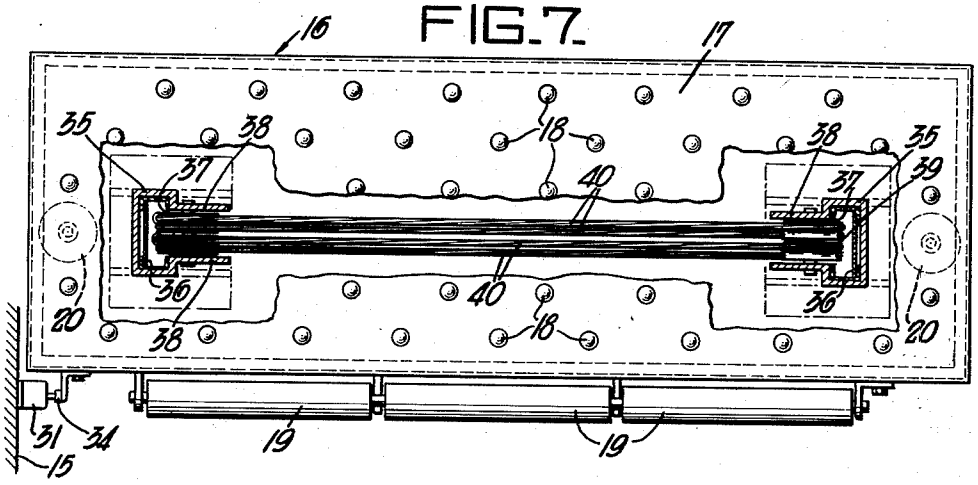
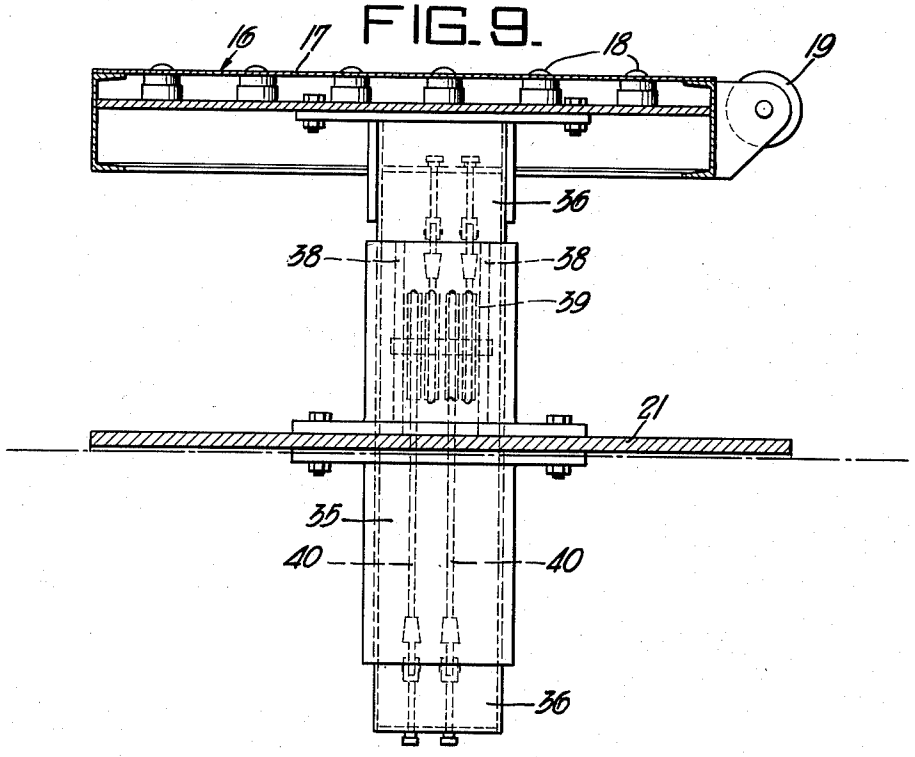


FIG. 9.



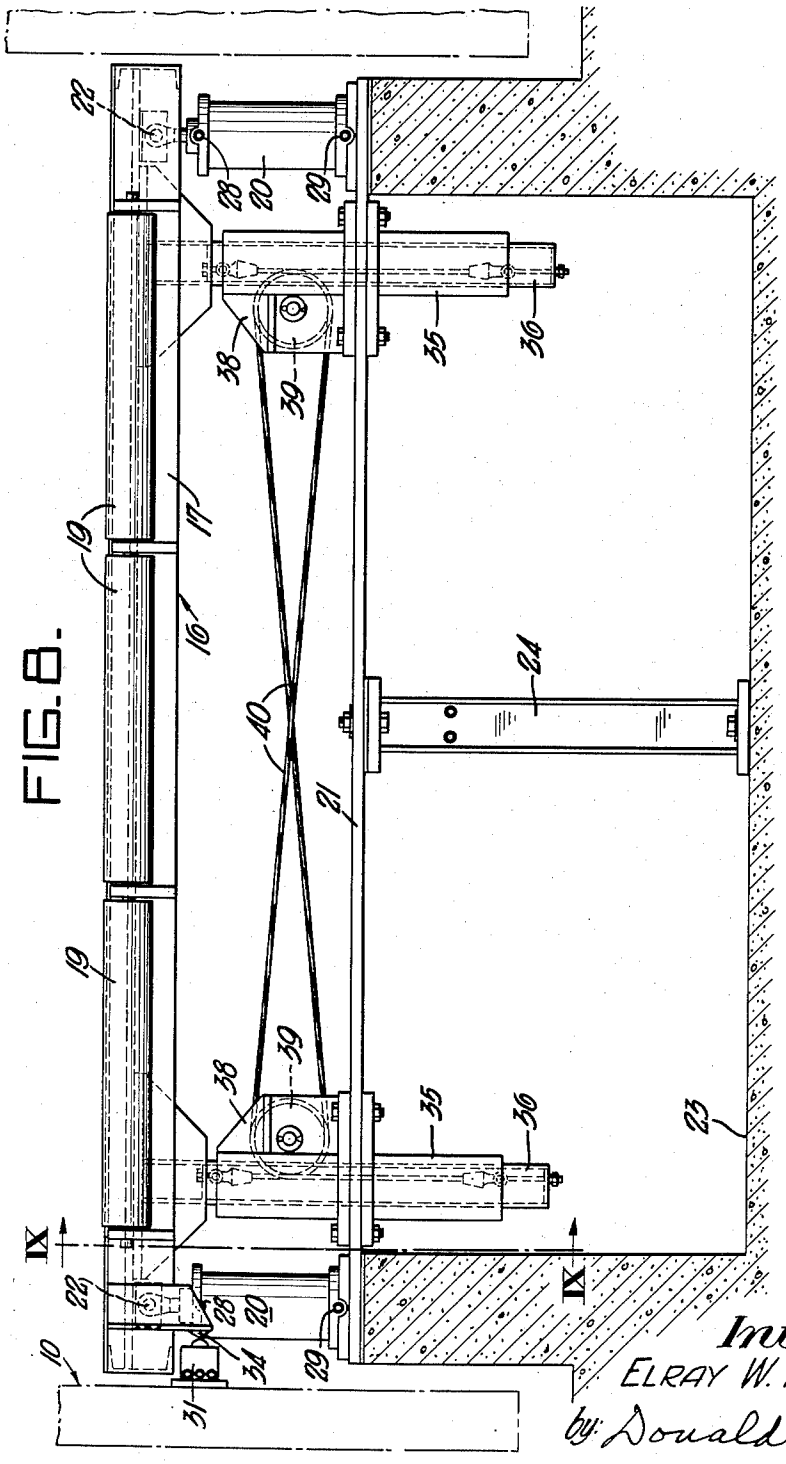
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TAKE-OFF EQUIPMENT FOR PLATE SHEARS

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FIG. 8.



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TAKE-OFF EQUIPMENT FOR PLATE SHEARS

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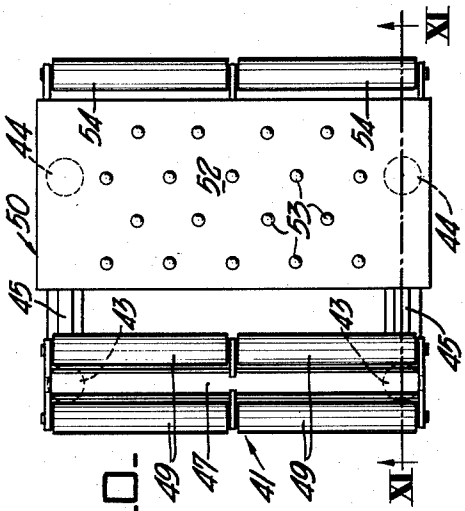


FIG. 10.

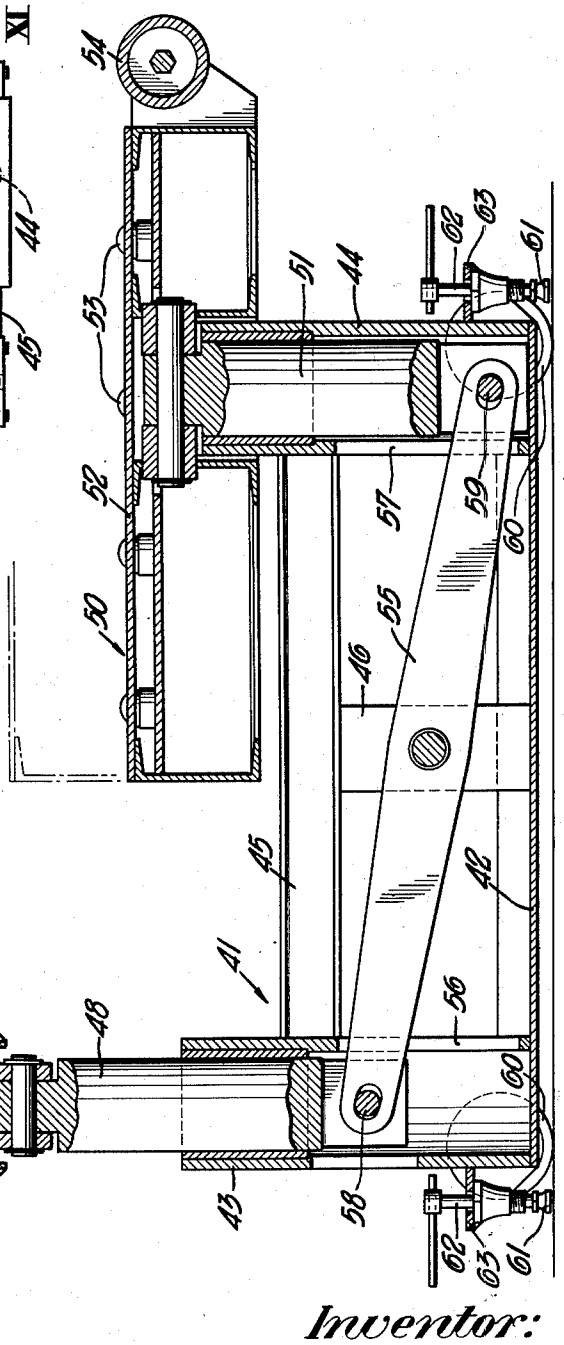


FIG. 11.

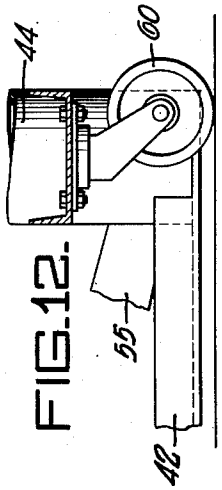


FIG. 12.

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TAKE-OFF EQUIPMENT FOR PLATE SHEARS

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FIG. 13.

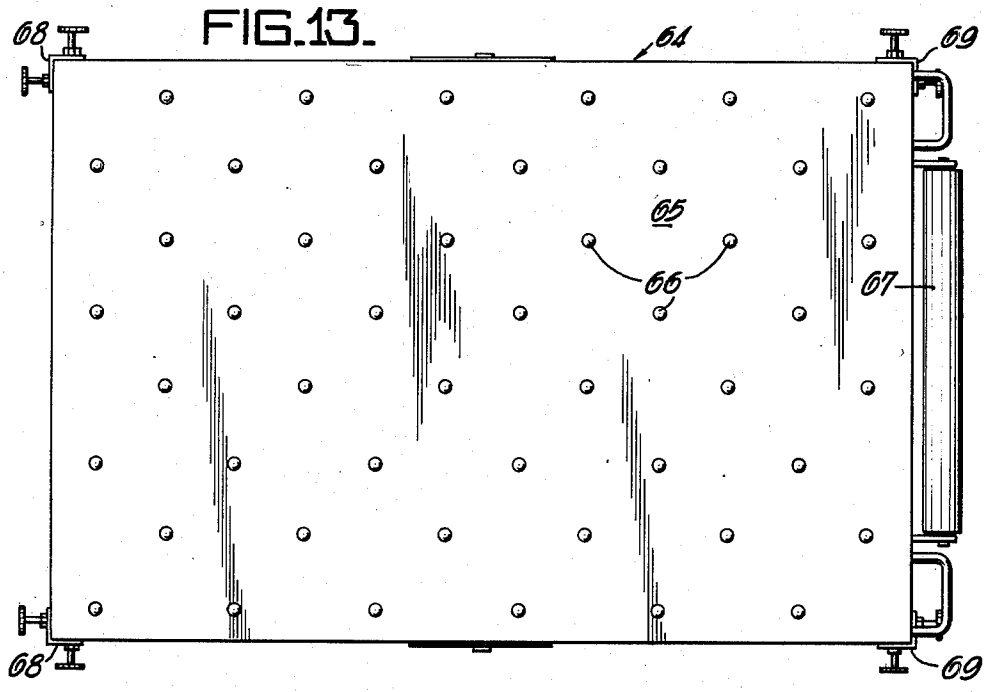
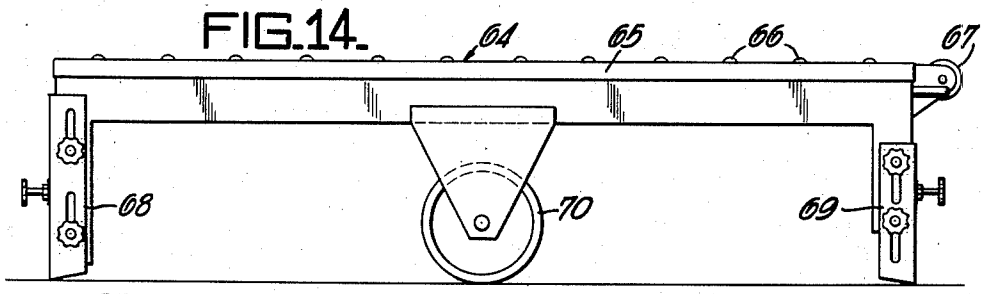


FIG. 14.



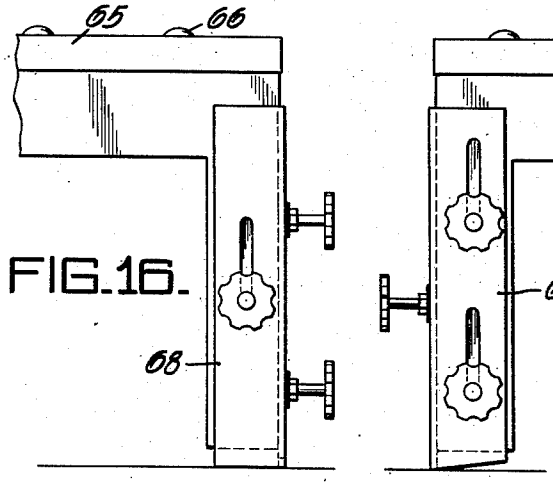


FIG. 16.

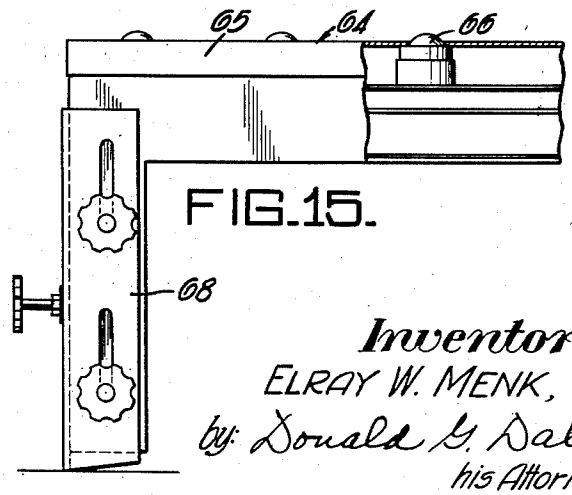


FIG. 15.

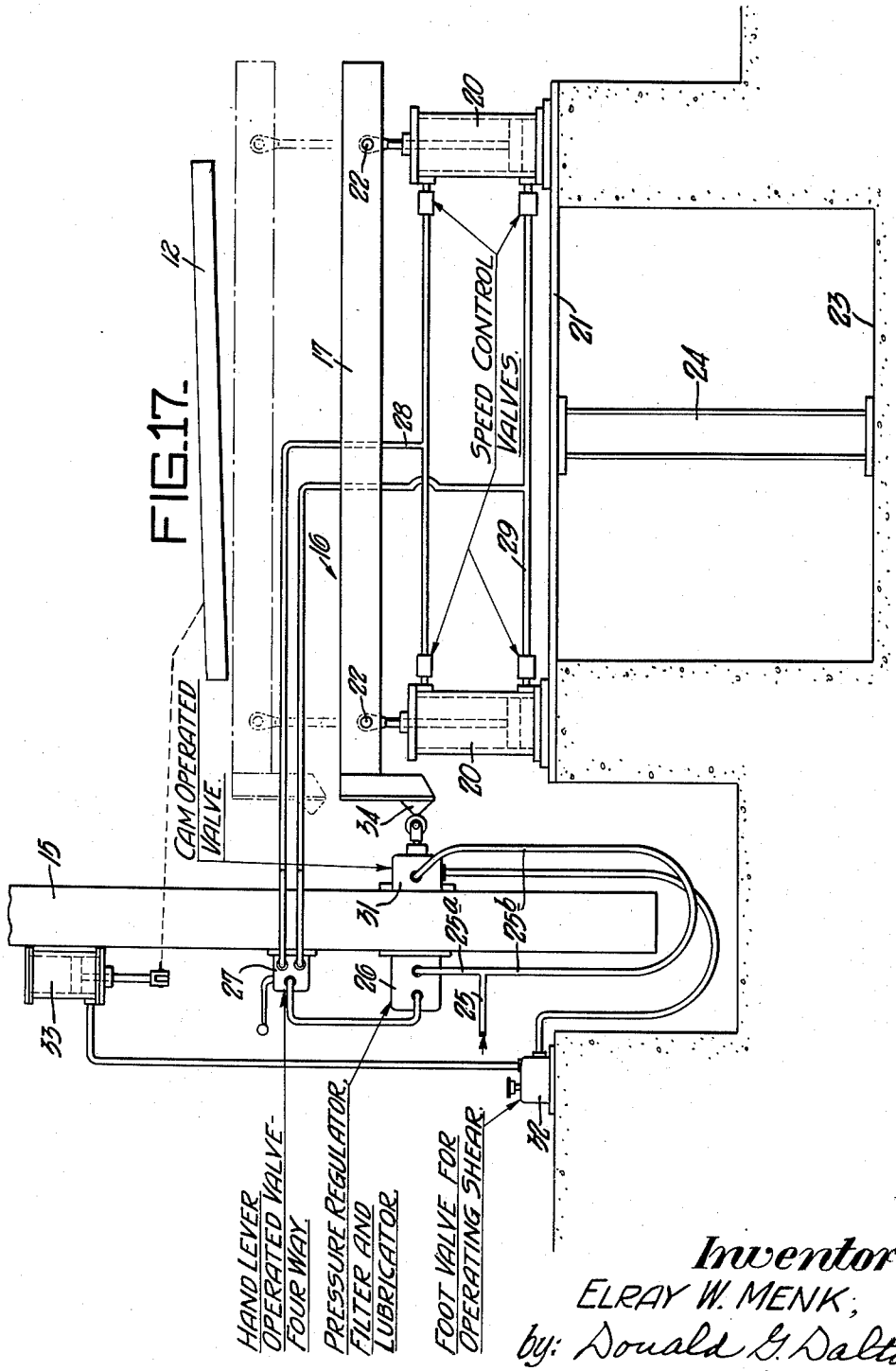
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TAKE-OFF EQUIPMENT FOR PLATE SHEARS

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FIG. 17.



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United States Patent Office 2,793,693 Patented May 28, 1957

2,793,693

TAKE-OFF EQUIPMENT FOR PLATE SHEARS

Elray W. Menk, Chicago, Ill., assignor to United States Steel Corporation, a corporation of New Jersey

Application February 24, 1953, Serial No. 338,270

7 Claims. (Cl. 164—47)

This invention relates to improved take-off equipment for plate shears.

An object of the invention is to provide improved take-off equipment which is adapted both to support plate lengths during a shearing operation and to facilitate subsequent delivery of the sheared lengths to other handling equipment.

A further object is to provide improved take-off equipment which in addition facilitates introducing a plate to a shear, but which can be lowered to a position where it does not interfere with the subsequent shearing operation.

A more specific object is to provide improved take-off equipment which includes a vertically movable pneumatically operated table situated immediately behind a set of shear knives and a transfer table situated beyond the first table and cooperable therewith for supporting sheared plates and facilitating their removal from the shear.

Another object is to provide an improved counterbalanced transfer table especially adapted to support plates of relatively long length as they are sheared and to tilt to conform to the rake of the shear knives.

In accomplishing these and other objects of the invention, I have provided improved details of structure, preferred forms of which are shown in the accompanying drawings, in which:

Figure 1 is a perspective view of a plate shear which has one form of take-off equipment constructed in accordance with my invention;

Figure 2 is an end elevational view showing the position of a plate as it is introduced to the shear and take-off equipment shown in Figure 1;

Figure 3 is a view similar to Figure 2, but showing the position after the shearing operation;

Figure 4 is a perspective view similar to Figure 1, but showing a modification used for shearing relatively short length plates;

Figure 5 is an end elevational view showing the position of a plate as it is introduced to the shear and take-off equipment shown in Figure 4;

Figure 6 is a view similar to Figure 5, but showing the position after the shearing operation;

Figure 7 is a top plan view on a larger scale of the vertically movable table common to the forms of both Figures 1 and 4;

Figure 8 is a front elevational view of the table shown in Figure 7;

Figure 9 is a vertical sectional view of this table taken on line IX—IX of Figure 8;

Figure 10 is a top plan view of the transfer table used in the form shown in Figure 1;

Figure 11 is a vertical sectional view on a larger scale of this transfer table taken on line XI—XI of Figure 10;

Figure 12 is a vertical sectional view illustrating one of the casters on which this table is supported;

Figure 13 is a top plan view of the transfer table used in the form shown in Figure 4;

Figure 14 is a side elevational view of the transfer table shown in Figure 13;

Figure 15 is a side elevational view on a larger scale of one of the legs of the table shown in Figure 13;

Figure 16 is an end elevational view of the leg shown in Figure 15; and

Figure 17 is a schematic front elevational view of the operating circuit for the table shown in Figures 7, 8 and 9.

Figures 1 to 6 show somewhat schematically a plate shear **10** which includes upper nad lower knives **12** and **13**, a table **14** on the entry side of said knives, and a housing **15** on the exit side. Plates P are introduced between the knives from the table **14**. When a plate is positioned for cutting, the portion beyond the knives is of the length desired in the sheared plate. The shear has mechanism not shown for lowering and raising the upper knife **12** and thus making a cut. Shears of such construction are well known and per se are not part of the present invention, so that no more detailed showing is deemed necessary.

In accordance with both embodiments of the present invention, a table **16** is situated within the housing **15** immediately behind the exit side of the knives **12** and **13**. As best shown in Figures 7, 8 and 9, this table includes a vertically movable top section **17**, the upper surface of which carries a number of balls or casters **18** to facilitate movement of plates thereacross. The exit edge of this top section preferably carries a plurality of rollers **19**. The top section **17** is supported on a pair of double-acting pneumatic pistons and cylinders **20** which are situated adjacent its opposite ends and rest on a base plate **21**. The connections between the top section and the piston rods preferably include shear pins **22** (Figure 8), which are adapted to break if an excessive load is placed on the table. Preferably the floor beneath the base plate **21** contains a pit **23**, and the central part of said base plate is supported on a column or strut **24** located within said pit.

Figure 17 shows schematically a preferred pneumatic circuit for operating the cylinders **20**. The circuit includes an air supply line **25** which has branches **25***a* and **25***b* leading to these cylinders and to the shear respectively. The branch **25***a* contains a regulator, filter and lubricator, indicated schematically at **26**, and extends to a hand operated four-way valve **27**. Lines **28** and **29** connect this valve to the tops and bottoms respectively of the cylinders **20**. Preferably the lines **28** and **29** contain speed control valves situated ahead of each cylinder. The four-way valve **27** has a position in which it admits air to cylinders **20** to lower the top section **17** of the table **16** and another position in which it admits air to the cylinders to raise the top section. The branch **25***b* contains a cam operated three-way valve **31** and a shear operator's three-way foot pedal valve **32**, and terminates at an air cylinder **33** at the shear clutch. The underside of the top section **17** carries a cam **34** which is cooperable with the valve **31**. This valve is normally closed and thus normally prevents operation of the shear clutch. The valve opens only when the top section **17** is lowered sufficiently that its cam **34** engages the operating lever of the valve. Therefore the shear cannot be operated until the top section is lowered. The individual items of the pneumatic circuit, such as the various valves, per se are not part of the present invention but can be of any standard or desired construction, and therefore are not shown in detail.

Preferably the table **16** includes an equalizer which connects opposite ends of its top section **17** to assure that they move up and down at the same rate and by the same amount. Referring again to Figures 7, 8 and 9, the equalizer illustrated includes a pair of fixed guideways **35**, which are carried by the base plate **21** adja-

cent opposite ends of the top section **17**, and a pair of legs **36**, which depend from the top section and are received in said guideways. The inner opposed faces of the guideways have vertical slots **37** and they carry pulley brackets **38** in each of which a quadruple pulley block **39** is rotatably mounted, one adjacent each end of the table. The inner opposed faces of the legs **36** also are slotted to receive the pulley blocks. A pair of cables **40** are dead-ended to the bottom of the leg **36** on the right, pass over two of the pulleys of the pulley block **39** at the right, extend to the left and downwardly under the table top, pass under two of the pulleys of the block **39** at the left, and are dead-ended at the top of the leg **36** on the left. A second pair of cables are reeved the opposite way; that is, they are dead-ended at the bottom of the leg at the left, pass over the pulleys at the left, under the pulleys at the right, and are dead-ended at the top of the leg at the right.

Figures 1, 2, 3, 10, 11 and 12 show one form of transfer table **41** which can be used in cooperation with the pneumatically operated table **16** for handling longer sheared lengths (for example those over eight feet long). The transfer table **41** has a rigid frame which includes a base **42**, a pair of vertically extending guides **43** at opposite ends of said base adjacent its entry side, a second pair of vertically extending guides **44** at opposite ends of the base adjacent its exit side, a pair of horizontal beams **45** extending between the guides **43** and **44**, and uprights **46** between the base and said beams. A carrier **47** is supported for vertical movement in the guides **43**, having depending legs **48** received in said guides. The upper end of the carrier **47** supports a plurality of rollers **49**. A second carrier **50** is supported for vertical movement in the guides **44**, having legs **51** received in these latter guides. The carrier **50** has a table top **52**, the upper surface of which contains a plurality of balls or casters **53**, and the exit edge of which carries rollers **54**. The two carriers **47** and **50** are interconnected to furnish a counterbalancing action. The connection includes a pair of levers **55**, each of which is pivoted to a different one of the uprights **46** extends through slots **56** and **57** in the guides **43** and **44** respectively, and has slotted pivotal connections **58** and **59** at its ends with the lower ends of the legs **48** and **51**.

Preferably the underside of the base **42** carries casters **60** to enable the transfer table to be moved about readily. The table also has vertically movable feet **61** which are mounted on screw-threaded jacks **62**. The latter are supported in brackets **63** fixed to the guides **43** and **44**. When it is desired to hold the table in a fixed location, the jacks **62** are turned down so that the feet **61** engage the supporting surface beneath the table.

In operation, the transfer table **41** is positioned beyond the exit side of the table **16** with its jacks **62** lowered as shown in Figures 1, 2 and 3. The top section **17** of the table **16** initially is in its raised position, where it is at the level of the shear knife **13** (Figure 2). A plate P is introduced, being fed over the table **14**, between the shear knives, over the table **16**, and on to the carriers **47** and **50** of the transfer table **41**. The plate rests on the balls or casters **18** and the rollers **19** on the top section **17**, the right hand rollers **49** on the carrier **47**, and the rollers **54** on the carrier **50**, which cooperate to allow the plate to be moved to the shearing position with a minimum of frictional resistance and knife dulling drag on the lower shear knife.

After the desired length of plate has been fed through the knives, the four-way valve **27** is operated to cause the cylinders and pistons **20** to lower the top section **17**. The leading end portion of the plate P remains supported on the transfer table **41**, mainly on the rollers **49** of the carrier **47** and the rollers **54** of the carrier **50**. When the top section **17** is fully lowered, the cam **34** opens the valve **31**, after which the operator can open the valve **32** to lower the upper shear knife **12** and thus shear the plate. As the plate is sheared, the carrier **47** depresses simultaneously allowing the plate to tilt sideways to conform to the rake of the upper knife. At the same time the counterbalancing action of the levers **55** raises the carrier **50** a proportionate distance. The sheared length can be removed readily, since it is supported on the various rollers and casters of the take-off equipment. After the upper shear knife returns to its normal position and the sheared plate length is removed, the equipment can be reset merely by operating the four-way valve **27** to raise the top section **17**.

Figures 4, 5, 6, 13, 14, 15 and 16 show a modified transfer table **64** which is somewhat simplified and can be used in cooperation with the pneumatic table **16** for handling shorter sheared lengths (for example those under eight feet long). Table **64** includes a top **65**, the upper surface of which carries a plurality of balls or casters **66** and the exit edge of which carries one or more rollers **67**. The table **64** has relatively long vertically adjustable legs **68** at its entry end, relatively short vertically adjustable legs **69** at its exit end, and wheels **70** at its mid-portion. The transfer table **64** is used in a manner similar to the transfer table **41**, already described, except that it remains at a constant angle of tilt determined by the position of adjustment of its legs **68** and **69**.

From the foregoing description, it is seen that the present invention furnishes simple easily operated mechanism for handling plates during a shearing operation. The handling equipment is positively interlocked with the shear to permit operation of the latter only when the handling equipment is properly positioned.

While two embodiments of my invention have been shown and described, it will be apparent that other adaptations and modifications may be made without departing from the scope of the following claims.

I claim:

1. The combination, with a plate shear, of take-off equipment comprising a table situated immediately adjacent said shear on the exit side thereof and having a vertically movable top section, a transfer table situated beyond the exit side of said first named table and cooperable therewith to support a plate during and after shearing, and antifriction means on said tables to facilitate movement of a plate thereacross, said transfer table including a rigid frame, a pair of carriers mounted for vertical movement on said frame, and a counterbalancing connection between said carriers adapted to raise either carrier when the other is lowered.

2. The combination, with a plate shear, of take-off equipment comprising a table situated immediately adjacent said shear on the exit side thereof and having a vertically movable top section, a transfer table situated beyond the exit side of said first named table and cooperable therewith to support a plate during and after shearing, and antifriction means on said tables to facilitate movement of a plate thereacross, said transfer table including a rigid frame having sets of vertical guideways at its entry and exit sides, a carrier mounted for vertical movement in the guideways at the entry side, a second carrier mounted for vertical movement in the guideways at the exit side, and a lever pivoted to said frame and having slotted and pivotal connections at its opposite ends with said carriers to furnish a counterbalancing action.

3. The combination, with a pneumatically operated plate shear, of take-off equipment comprising a table situated immediately adjacent said shear on the exit side thereof and having a vertically movable top section and pneumatic means for raising and lowering said top section, a transfer table situated beyond the exit side of said first named table and cooperable therewith to support a plate during and after shearing, antifriction means on the supporting surfaces of said tables to facilitate movement of a plate thereacross, and an interlock between the pneumatic operating means of said shear and of said first

named table to prevent operation of said shear unless the table is lowered.

4. A combination as defined in claim 3 in which said interlock includes a valve in the pneumatic circuit to said shear and a cam carried by said movable top section for operating said valve.

5. The combination, with a plate shear, of take-off equipment comprising a table situated immediately adjacent said shear on the exit side thereof and including a vertically movable top section, antifriction means on the upper surface and exit edge of said top section, and pneumatic means for raising and lowering said top section, and a transfer table situated beyond the exit side of said first named table and cooperable therewith to support a plate during shearing, said transfer table including a rigid frame having two sets of vertical guideways adjacent its entry and exit sides, a carrier mounted for vertical movement in the guideways adjacent the entry side, a second carrier mounted for vertical movement in the guideways adjacent the exit side, a lever pivoted to said frame and having slotted and pivotal connections at its opposite ends with said carriers to furnish a counterbalancing action, and antifriction means carried on the upper surfaces of each of said carriers.

6. A combination as defined in claim 5 in which the antifriction means on said first named carrier include rollers mounted on the top thereof, and said second named carrier includes a table top and the antifriction means thereon includes a plurality of balls mounted in the upper surface thereof and rollers mounted at the exit edge.

7. A combination as defined in claim 3 in which said transfer table includes a rigid frame, a pair of carriers mounted for vertical movement on said frame, and a counterbalancing connection between said carriers adapted to raise either carrier when the other is lowered.

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