June 3, 1969 J. D. KREPP ET AL 3,447,695

STACKER

Filed Nov. 21, 1966 Sheet 1 of 4

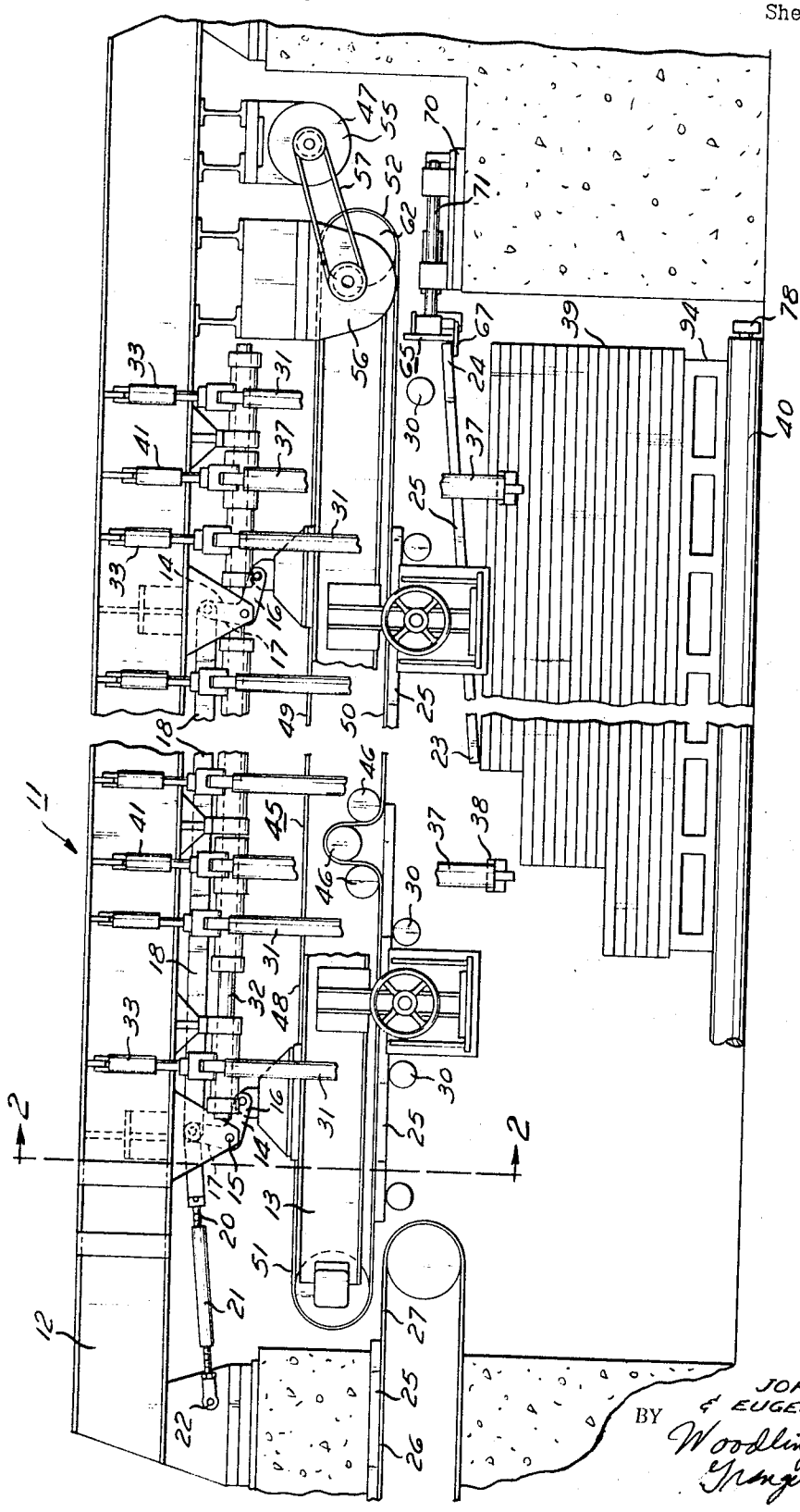

Fig. 1

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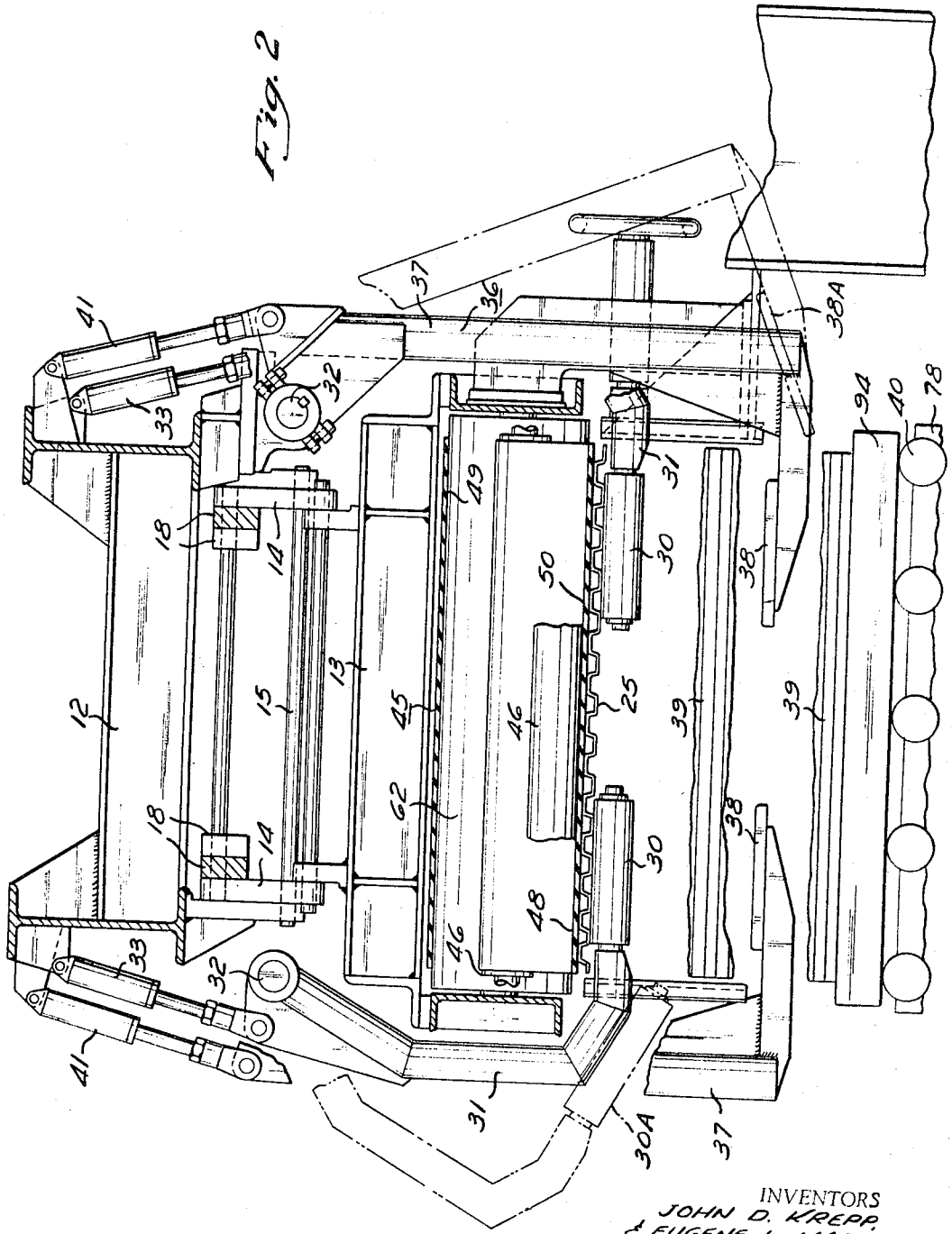
Fig. 2



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Sheet 3 of 4

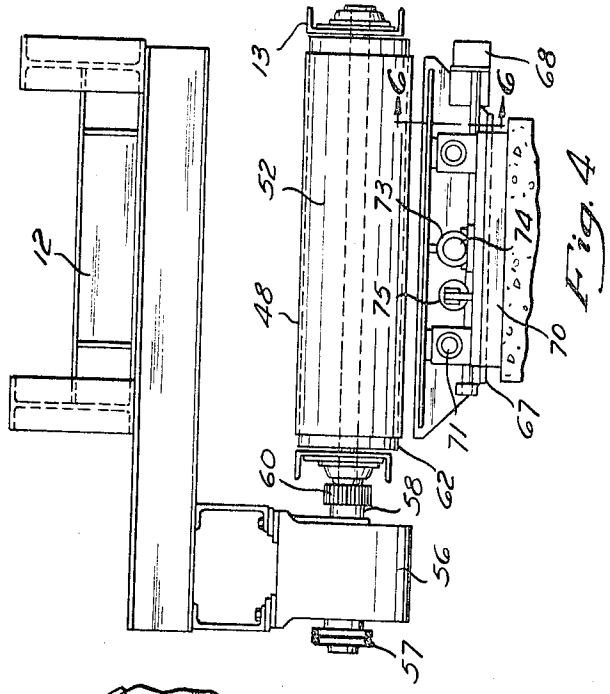

Fig. 4

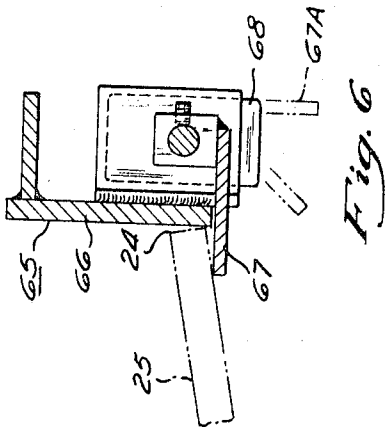

Fig. 6

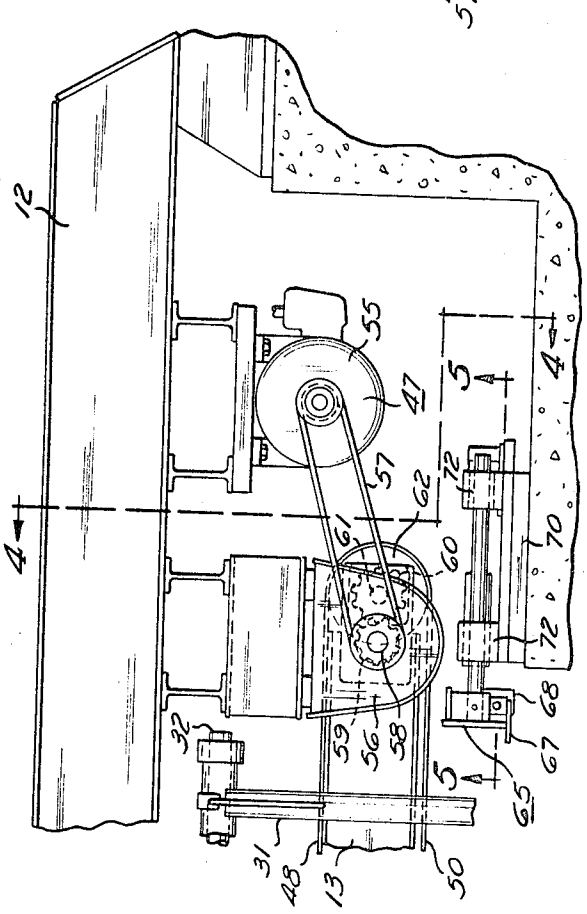

Fig. 3

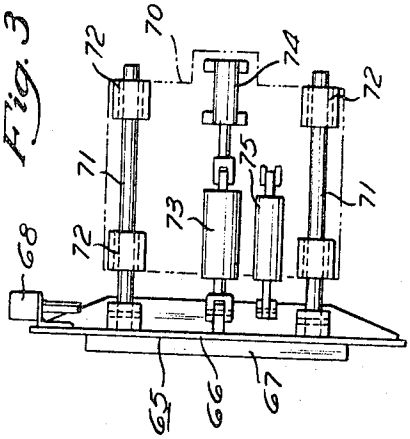

Fig. 5

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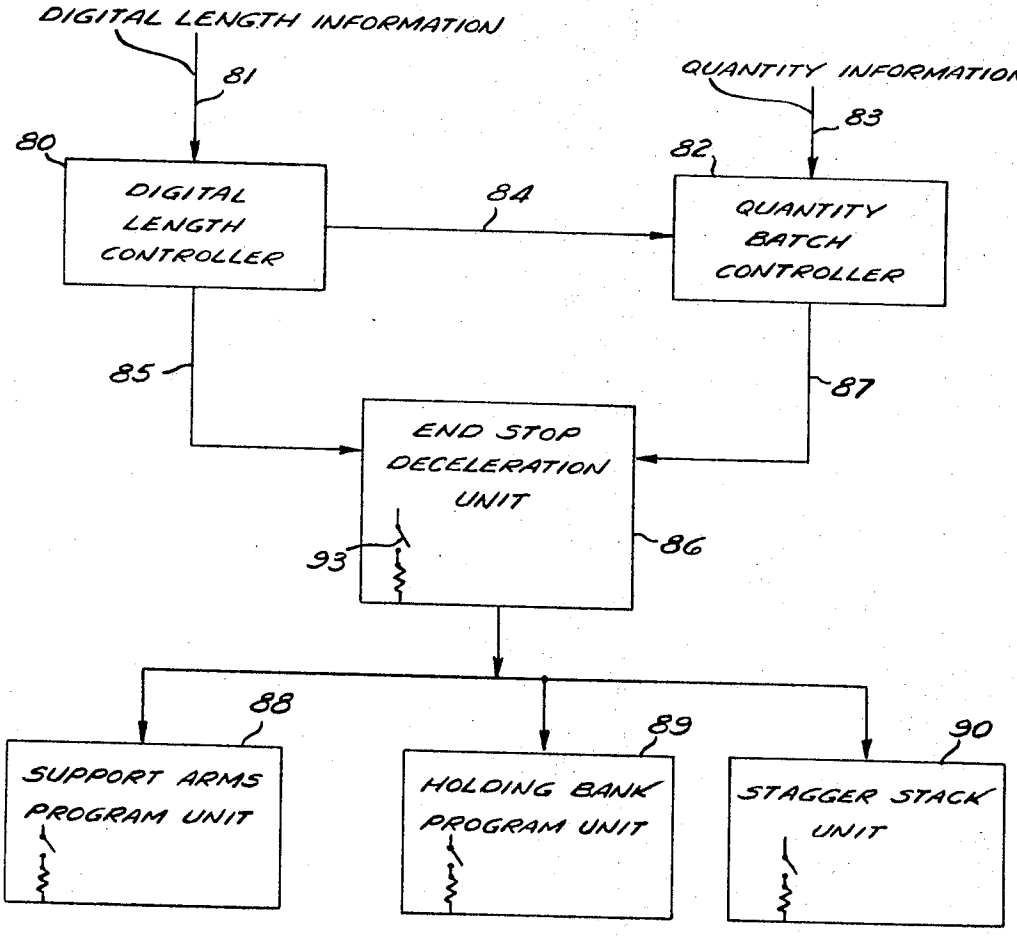

Fig. 7

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United States Patent Office 3,447,695 Patented June 3, 1969

3,447,695

STACKER

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Filed Nov. 21, 1966, Ser. No. 595,829
Int. Cl. B65g 57/03; B65h 31/34
U.S. Cl. 214—6
15 Claims

ABSTRACT OF THE DISCLOSURE

The disclosure relates to apparatus for stacking pieces which are supported on roller supports in a pass plane and moved by contact with the lower run of a belt conveyor. Selected ones of the plural roller supports are swung downwardly out of the pass plane to drop the pieces which may be of variable length and accordingly the selected number of roller supports that are swung downwardly is varied. The pieces drop onto a stack and hit an end stop, and are then pushed slowly upstream into alignment in the stack.

The invention relates in general to a stacking or piling mechanism and more particularly to a mechanism to stack or pile pieces coming from a continuous processing line such as from a flying cutoff for sheet metal pieces and the like. The pieces may be flat or may be rolled or formed shapes, for example, corrugated metal roofing and other formed pieces.

The invention may be incorporated in a stacker, comprising, in combination, a fixed frame, a plurality of supports on said frame for supporting pieces to be stacked, said supports each having first and second conditions with said first condition establishing the pieces in a pass plane parallel to said plurality of supports, means to convey the pieces toward the downstream end of the conveying means with said supports in said first condition, said second condition of said supports being a divert condition to divert pieces from said pass plane, stop means facing upstream engageable by the downstream end of the pieces diverted from said conveying means, and means to selectively control said first and second conditions of each of said plurality of supports to selectively divert pieces of variable lengths from said pass plane of said conveying means onto a stack with the downstream end of the pieces adjacent said stop means and the upstream end of the pieces a variable distance from said stop means in accordance with the length of each of the pieces.

In many continuous processing mechanisms, a continuous strip is processed for convenience in handling rather than the slower batch process of a group of individual pieces. Next a flying cutoff is used to cut the continuous strip into pieces of the desired length, and then these cut off pieces must be stacked and removed from the vicinity of the end of the processing line. As continuous processing lines become faster in operation, the stacker must also become faster. Speeds of 300 feet per minute are now becoming common for such things as sheet metal roofing forming line and stacker mechanisms of the prior art have been unable to adequately cope with this higher speed of operation. Further increased flexibility is desired by having the pieces coming off of variable lengths and the stacker should be able to stack pieces of such variable lengths. Many art stackers had the construction wherein the cut off pieces were trapped between first and second stops at each end of the pieces, and when a change in length was desired, it was necessary to shut down the machine or at least to stop the flow of cut off pieces in order to change one of these end stops. This interruption of the entire processing line was highly undesirable.

Accordingly an object of the present invention is to obviate the above mentioned disadvantages.

Another object of the invention is to provide a stacker which will stack pieces at high speeds.

Another object of the invention is to provide a stacker which will readily stack pieces of variable lengths.

Another object of the invention is to provide a stacker wherein the length of the stacked pieces may be changed while the pieces are coming off a processing line and being stacked.

Another object of the invention is to provide a stacker wherein a stack is controlled or aligned only at the downstream end and the pieces are not trapped between two stops.

Another object of the invention is to provide a stacker which may operate at high speed and which permits the pieces to be dropped onto a stack with a minimum of "falling leaf" floating in the air during dropping.

Another object of the invention is to provide a stacker wherein the pieces are precisely positioned on a stack without the necessity of engaging both ends of the stacked piece.

Another object of the invention is to provide a stacker wherein the pieces are selectively diverted from a pass plane by a changed condition of a plurality of supports by selecting certain ones of the plurality of supports in accordance with the length of the piece being stacked.

Another object of the invention is to provide a stacker with only a single end stop facing upstream.

Another object of the invention is to provide a stacker which may be readily adjusted in vertical position to accommodate pieces of variable thickness.

Another object of the invention is to provide a stacker wherein pieces are supported and conveying means are provided to move the pieces until the desired position is reached for stacking.

Another object of the invention is to provide a stacker wherein different length pieces may be piled on a single stack with the length changing during the run of pieces.

Other objects and a fuller understanding of the invention may be had by referring to the following description and claims, taken in conjunction with the accompanying drawings, in which

FIGURE 1 is a side elevational view of a stacker embodying the invention;

FIGURE 2 is an enlarged sectional view of line 2—2 of FIGURE 1;

FIGURE 3 is an enlarged elevational view of part of the adjustment mechanism of the stacker;

FIGURE 4 is a sectional view on line 4—4 of FIGURE 3;

FIGURE 5 is an enlarged plan view of the stop means;

FIGURE 6 is a vertical sectional view of part of the stop means; and,

FIGURE 7 is a diagrammatic view of the program controller for the stacker.

The figures of the drawing show the preferred embodiment of the invention in a stacker **11**. This stacker includes a fixed frame **12** and a movable frame **13**. The movable frame **13** is carried on the fixed frame **12** by bell crank levers **14** having a pivot **15** on the fixed frame **12**. A first arm **16** has an end pivoted to the movable frame **13**, and a second arm **17** has an end pivoted to links **18** which interconnects all of the bell crank levers **14**. A screw **20** and nut **21** connect the links **18** to the fixed frame at a pivot connection **22**. By adjusting the screw **20** and nut **21**, the links **18** may be moved forwardly and backwardly to adjust all of the bell crank levers **14** simultaneously. This moves the movable frame **13** up and down for height adjustments, to be later explained.

The stacker **11** stacks pieces **25** coming from a flying cutoff, not shown, along a pass plane **26** by a conveyor **27**. As shown in FIGURE 2, the pieces **25** may be cor-

rugated, as one example, so that even though of relatively light gauge sheet metal, the effective thickness of each piece might be one-half inch or up to two inches, for example. This is the necessity for the height adjustment of the movable frame **13** to accommodate the effective thickness of each piece **25**.

In the stacker **11** the pieces **25** are supported by a plurality of supports **30**. These supports, in this preferred embodiment, are support rollers journalled on the lower ends of arms **31**. The plurality of arms are journalled on shafts **32** for at least partial arcuate movement. The shafts **32** are provided one on each side of the fixed frame **12** and parallel to the pass plane **26** on each side of and above the movable frame **13**. The supports **30** have first and second conditions with the first condition being illustrated in solid lines in FIGURE 2. This first condition is one wherein the support rollers **30** are generally horizontal and the axes thereof are perpendicular to the pass line of the pieces **25** in the pass plane **26**. This pass line is along the longitudinal length of the stacker **11**. This first condition of the plurality of support rollers supports the pieces **25** in this pass plane. The second condition of the supports **30** is shown in phantom lines **30A** in FIGURE 2 with these supports positioned laterally to one side of the movable frame **13**. This is a release condition to permit the pieces **25** to be diverted from the pass plane, in this case they are permitted to drop by gravity from this pass plane. The second condition shown at **30A** of the supports is caused by the arms **31** swinging laterally outwardly on the shafts **32** to move the supports **30** laterally beyond each side of the movable frame **13**. Fluid power cylinders **33** are connected between the fixed frame **12** and the arms **31** in order to move the supports **30** between the first and second conditions.

A holding bank **36** also is provided on the shafts **32**. This holding bank includes a plurality of arms **37** journalled on the shafts for partial rotation. Pads **38** are carried on the lower ends of the arms **37** and have a first condition, shown in solid lines in FIGURE 2, disposed generally horizontally beneath the movable frame **13**. The pads **38** also have a second condition shown in phantom lines **38A** disposed to one side of the movable frame **13**. The holding bank **36** is provided to temporarily hold pieces **25** when a completed stack **39** is to be moved from underneath the stacker **11**, as by the power driven rolls **40**. Fluid power cylinders **41** are connected to the arms **37** to move the holding bank between the first and second conditions.

Means is provided to convey the pieces **25** on the plurality of support rollers **30**. This conveying means **45** conveys the pieces generally along the pass plane **26**. The support rollers **30** in the first condition thereof support the pieces for action by the conveying means **45**. The conveying means **45**, in this preferred embodiment, is illustrated as carried on the movable frame **13** and is adjustable in height dependent on the thickness of the pieces as mentioned above. The conveying means **45** includes a plurality of rolls **46** and drive means **47**. The rolls **46** are accordingly power driven, and the support rollers **30** hold the pieces **25** in frictional engagement with this conveying means **45** to effect the movement of the pieces. All of the rolls **46** are substantially simultaneously power driven by a belt conveyor **48** having upper and lower runs **49** and **50**, respectively, and upstream and downstream ends **51** and **52**, respectively. The lower surface of the lower run **50** is that which frictionally engages the upper surface of the pieces **25** to convey them downstream along the pass plane **26**. The entire belt conveyor **48** may have several sets of three rollers **46**, only one set being shown, along the length of the lower run **50** in order to take up the slack and more importantly to break up the lower run **50** into shorter lengths so that the sag of the belt is not appreciable. This is especially important when the arms **31** have moved to the second or release condition to drop a piece **25** and are subsequently returned to the first condition to support the next piece **25** up against the belt conveyor **48**.

The drive means **47** includes an electric motor **55** mounted on the fixed frame **12** which drives a speed reducer such as a gear reducer **56** by means of a belt **57**. The gear reducer **56** in also mounted on the fixed frame **12** and has an output shaft **58**. A drive gear **59** is mounted on this output shaft and meshes with a driven gear **60** on the input shaft **61** of one sheave or end roll **62** for the belt conveyor **48**. The distance between the output shaft **58** and input shaft **61** is the same as the length of the first arm **16** of the bell crank levers **14**. Accordingly the intermeshing gears **59** and **60** remain enmeshed as the screw and nut means **20** and **21** is adjusted to move all of the bell crank levers **14** and adjust the height of the movable frame **13**. The bell crank levers **14** establish the pivotal connection between the output and input shafts **58** and **61** or additionally there may be provided an actual physical pivotal link between these two shafts **58** and **61**, although in practice this has not been found necessary. The bell crank levers **14** provide a form of parallelogram connection to maintain the movable frame **13** horizontal, in this case parallel to the pass plane **26** throughout the height adjustment. Also the gears **59** and **60** are accordingly maintained in drive engagement in the drive train during this height adjustment.

FIGURES 1, 3, 5 and 6 show stop means **65** which faces upstream to engage the downstream end **24** of the pieces **25**. In this case, the stop means **65** is positioned adjacent the downstream end of the stacker **11** in order to utilize the entire length of the stacker especially for long pieces to be stacked.

In one practical embodiment of the invention, the stacker was capable of stacking pieces up to a maximum of 32 feet long, and of practically any length shorter than such maximum length.

The stop meaans **65** includes first and second portions **66** and **67**, respectively. This stop means is better shown in FIGURES 5 and 6 wherein the first portion **66** is generally vertical and faces upstream to engage the downstream end **24** of the pieces **25**. The second portion **67** is a shelf which has first and second conditions. The first condition is as shown in FIGURE 6 wherein it is generally horizontal and constitutes a shelf to support the downstream end **24** of the pieces **25**. The second condition of the shelf **67** is a position **67A** as shown in phantom lines on FIGURE 6 wherein the shelf **67** has been rotated approximately 90 degrees relative to the first portion **66** to drop the downstream end **24** of the pieces onto the stack **39**. A rotary fluid motor **68** is connected to move the shelf **67** between the first and second conditions.

The stop means **65** may be mounted on a base **70** which is fixed relative to the fixed frame **12**. This stop means **65** is carried on slide rods **71** slidably journalled in bearings **72** to move rearwardly or downstream upon being struck by a piece **25**. A shock absorber **73** is mounted between the first portion **66** and the base **70** to absorb the impact from the pieces **25** as they strike the first portion **66**. A fluid cylinder motor **74** may be connected in axial alignment with shock absorber **73** and may have a predetermined stroke, for example, two inches in order to effect a stagger stacking of the stack **39**. This stagger stacking is to permit a predetermined number, for example, ten pieces to be stacked in vertical alignment and then the next ten pieces are stacked displaced by a predetermined amount for example, one or two inches. The next group of ten pieces is stacked in alignment with the first group and so on. This helps an observer to quickly count the number of pieces in a given stack and also helps separating the stack at a required number of pieces. A fluid cylinder motor **75** is connected between the first portion **66** and the base **70** to slowly return the first portion **66** upstream after it has been pushed downstream by the impact of a piece **25** diverted from the conveying means **45**. During the last portion of the upstream return

movement, the shelf **67** is swung downwardly to the second position **67A** in order to drop the downstream end **24** of the piece into precise alignment with the other pieces on the stack **39**.

A lifter **78** may be provided to lift the power driven rollers **40** upwardly, and then to lower these rollers progressively as the stack **39** builds. This maintains the top of the stack closely adjacent below the supports **30** so that the pieces **25** do not have far to fall.

FIGURE 7 diagrammatically illustrates the control mechanism including a program controller. A digital length controller **80** is provided having an input **81** into which digital length information is fed by an operator. This will be information as to the length of each piece to be cut by the flying cutoff, not shown, and to be handled by the stacker **11**. Also a quantity batch controller **82** is provided having an input **83** into which an operator supplies information as to the number of pieces in each batch of a predetermined length. The digital length controller **80** has a first output **84** to control the batch controller **82** to correlate the information on the length of each piece in the batch. The digital length controller **80** also has a second output **85** to an end stop deceleration unit **86**. This unit **86** also has another input **87** from the batch controller **82**. The end stop deceleration unit **86** is connected to control the cylinder **75** effecting upstream return movement of the stop means first portion **66**. The end stop deceleration unit **86** has three outputs. One to support arms program unit **88**, another to the holding bank program **89** and a third to a stagger stack unit **90**. The support arms program unit **88** is connected to control the cylinder **33** moving the support arms **31**. The holding bank program unit **89** is connected to control cylinders **41** which move the holding bank **36**. The stagger stack unit **90** is connected to control the fluid cylinder **74** which provides stagger stacking in the stack **39**.

Operation

The stacker **11** may be controlled in a highly automated manner. As an example, if one is stacking pieces of sheet metal coming off the flying cutoff of a continuous processing line, this stacker **11** will stack pieces of various lengths, automatically according to a predetermined program. As an example, let it be assumed that it is desired to cut fifteen pieces **25** each thirty feet in length and stack these and then to immediately change to cutting and stacking twenty additional ten foot long pieces. The length information of thirty feet is supplied on the input **81** to the length controller **80** and then the number of pieces in the batch, namely fifteen, is supplied on the input **83** to the batch controller **82**. These inputs may be digital inputs of any form such as punched cards, punched tape or magnetic tape. The length of ten feet for the pieces of the second batch is next supplied to the length controller **80** and the twenty pieces for that batch supplied on the input **83** to the batch controller **82**. The holding bank **36** will be in the second position **38A** of the pads **38** to be out of the way. The processing line may then be started, and the flying cutoff will be programmed to cut the required length of pieces. Sensing means, not shown, will sense the length of each piece so that is may be cut at the required lenth. The conveyor **27** may be run at a higher speed than the flying cutoff in order to accelerate the pieces and provide a space between each piece **25** as it approaches the stacker **11**. Sensing means, not shown, count the number of pieces, and hence this information on length and number of pieces is also fed into the length controller and batch controller **80** and **82**, respectively. With the first piece of thirty foot length being supplied to the stacker **11**, all of the support rollers **30** will be in the first condition which holds the pieces against the bottom run **50** of the belt conveyor **48**. Accordingly, this piece is conveyed the full length of the stacker **11**. When the piece has run the full length of the stacker, it will strike the stop means **65**. The shock absorber **73** will absorb the impact of the piece **25** and a limit switch **93**, shown in FIGURE 7, is actuated by movement of stop means **65** to cause the support arms **31** to be swung outwardly by the fluid cylinders **33**. This is under the control of the support arms program unit **88**. Accordingly, the support rollers **30** move from the first condition to the second or release condition to permit the piece **25** to drop. The upstream end **23** of the piece **25** will drop to the stack. In this case at the beginning of the stacking the first piece will drop to a pallet support **94** carried on the lifter **78**. The downstream end **24** will drop only a short distance to the shelf **67**. The support arms **31** having released the piece **25** will next swing back to the first condition to be in a position to receive the next piece coming off the conveyor **27** along the pass plane **26**. Meanwhile, the end stop first portion **66** having retracted under the impact of the piece **25**, will now be returned slowly upstream by the fluid cylinder **75**. During this upstream movement, the downstream end **24** of the piece will be supported on the shelf **67**. During the final portion of this upstream movement, the rotary fluid motor **68** will be actuated to drop the shelf **67** and hence drop the downstream end of the piece **25** into precise alignment on the stack **39**. The stop means **65** will now be in its initial position ready to receive the downstream end of the next piece coming off the conveying means **45**.

After ten pieces have been counted by the batch controller **82**, in the above example, the stagger stack cylinder **74** may be actuated to move the stop means **65** upstream the predetermined amount. This may be one or two inches, for example, to stagger the next group of pieces **25**. After the number of pieces in the batch have been counted, fifteen pieces in the above example, the batch controller **82** will switch to the next batch. As the ten foot pieces **25** come along the support rollers **30**, as moved by the conveying means **45**, they also will strike the stop means **65**. Now, however, the length controller **80** will control the support arms program unit **88** so that only the last five of the support roller arms **31** are moved outwardly. This is with the assumption that the support rollers are spaced at two foot intervals, and hence the supports next adjacent the stop means **65** are those which are actuated to the second or release condition. This drops only the last piece adjacent the stop means **65** while the support rollers **30**, upstream from this ten foot length, remain in their first condition to support pieces **25** being conveyed through the stacker **11**.

Again the pieces, of shorter length this time, drop to the stack with the upstream end **23** frictionally engaging the stack and the downstream end **24** supported on the shelf **67**. Again the stop means **65** is retracted under the impact and is then moved upstream by the cylinder **75** to precisely position the piece on the stack.

The lifter **78** gradually lowers as the stack builds to maintain the top of the stack **39** closely below the level of the pads **38** of the holding bank **36**. When the stack has reached maximum height, then the holding bank program unit **89** is actuated to move the holding bank pads **38** from the second to the first position underneath the conveying means **45**. This holding bank **36** permits temporary storage of pieces still coming off the processing line while the power operated rollers **40** move the stack **39** laterally from underneath the stacker **11** to a storage position. The lifter **78** may then lift another pallet support **94** into position beneath the support pads **38** and in fact may actually lift the temporarily held stack off the pads **38** so that the holding bank **36** may be swung outwardly to the second condition **38A**. This permits continuous running of the processing line and the stacker **11** so that the entire line need not be shut down merely because one stack **39** is completed.

Only one simple example has been given of only two lengths, but it will be obvious to one skilled in the art that the stacker **11** may be programmed to stack any desired length of pieces and with any number of pieces to a batch and with a different length of pieces in successive batches in any desired order.

Because there is only the single stop means **65** which is near the downstream end, and which faces upstream, there is no need to move any stop means in the stacker **11** in order to change length of pieces. Prior art stackers trapped the pieces between a downstream and an upstream end stop. This meant that it was necessary to shift the lengthwise position of one of these stops in order to change length of pieces being stacked. Whereas the conveying means of the prior art might be left running, this would not mean that pieces could be actually coming off the stacker during this length adjustment. The adjustment usually required unfastening some bolts and physically moving the large end stop to a new position. This took several minutes, and accordingly it was mandatory to stop the pieces coming into the stacker. The present invention obviates such a situation wherein the entire processing line has to be shut down. The pieces being stacked are all physically aligned at the downstream end by the stop means **65**, and the upstream end is not engaged by a stop and is a variable distance from the stop means **65**. Hence there is no stop means that needs to be moved for length adjustment. The support arms program unit **88** controls a selected number of the support roller arms **31** adjacent to and immediately upstream from the stop means **65** in accordance with the length of the piece being conveyed at that instant to the stack **39**. This assures that the following pieces will still be supported by the support rollers **30**.

The stacker **11** uses the supports **30** to establish the pieces **25** in the pass plane **26**. Means is provided to divert pieces from this pass plane, and in this preferred embodiment such means is the arrangement of the stacker so that the pieces fall by gravity from the pass plane when the support rollers **30** are moved to the second condition **30A**. The stop means **65** has the first portion **66** which is disposed generally perpendicular to the pass plane **26** and has the second portion or shelf **67** which is disposed generally parallel to the pass plane **26**. As illustrated in FIGURE 1, after the pieces **25** have fallen, the upstream end **23** will frictionally engage the stack **39** and the downstream end **24** will rest on the shelf **67**. This supports the piece **25** at an acute angle to the horizontal. This accomplishes two things. The first is that it eliminates the "falling leaf" effect of a flat sheet attempting to fall while in a generally horizontal position. The air beneath it tends to make it move from side to side and along its length and it does not fall directly vertically downwardly. Accordingly, if the pieces were merely allowed to fall, they would not fall directly on the stack **39** into alignment therewith. The second beneficial effect is that the acute angle of the piece **25** means that the upstream end **23** frictionally engages the topmost piece on the stack. Thus as the cylinder motor **75** moves the piece slowly back upstream, the upstream end **23** will stabilize the piece **25** so that it will be precisely aligned into position on the stack **39**.

The stop means **65** has the first and second portions **66** and **67**, respectively. As the stop means is returned back upstream by the fluid cylinder motor **75**, the shelf **67** and the first portion **66** relatively move to permit the downstream end **24** of the piece to drop. In this preferred embodiment the shelf **67** moves downwardly from a generally horizontal position toward a generally vertical position to permit this relative movement.

The present disclosure includes that contained in the appended claims, as well as that of the foregoing description. Although this invention has been described in its preferred form with a certain degree of particularity, it is understood that the present disclosure of the preferred form has been made only by way of example and that numerous changes in the details of construction and the combination and arrangement of parts may be resorted to without departing from the spirit and the scope of the invention as hereinafter claimed.

What is claimed is:

1. A stacker, comprising, in combination, a fixed frame,
a plurality of spaced supports on said frame arranged longitudinally along the path of travel of pieces for supporting pieces to be stacked.
said supports each having first and second conditions with said first condition establishing the pieces in a pass plane parallel to said plurality of supports,
means to convey the pieces toward the downstream end of the conveying means with said supports in said first condition,
said second condition of said supports being a divert condition to divert pieces from said pass plane,
stop means facing upstream engageable by the downstream end of the pieces diverted from said conveying means,
and means to selectively control said first and second conditions of each support of said plurality of supports to select the second condition of those supports which correspond to the length of the piece to selectively divert pieces of variable lengths from said pass plane of said conveying means onto a stack with the downstream end of the pieces adjacent said stop means and the upstream end of the pieces a variable distance from said stop means in accordance with the length of each of the pieces whereby a stack of different length pieces may be formed.

2. A stacker as set forth in claim **1** wherein said conveying means includes a plurality of rolls with the lower surface thereof disposed generally in said pass plane, and means to substantially simultaneously drive each of said rolls.

3. A stacker as set forth in claim **1** including a movable frame for said conveying means,
connection means to support said movable frame for parallelogram movement relative to said fixed frame for movements of said movable frame transverse to the said pass plane,
drive means on said fixed frame,
and a drive train from said drive means to said conveying means and including a pivotal connection of the same length as said parallelogram connection to maintain said drive train in engagement despite parallelogram adjustment of said conveying means.

4. A stacker as set forth in claim **3** wherein said parallelogram connections include bell crank levers to pivotally support said movable frame relative to said fixed frame,
a link interconnecting all of said bell crank levers for simultaneous parallelogram movement,
and screw and nut means to adjust said link means relative to said fixed frame to adjust the transverse dimension of said conveying means relative to said pass plane.

5. A stacker as set forth in claim **3** including an output shaft on said drive means,
an input shaft on said conveying means,
and means disposing said pivotal connection of said drive train as pivoted on the axes of said output and input shafts to maintain a constant distance therebetween despite pivotal movements of said drive train pivotal connection during transverse adjustments.

6. A stacker as set forth in claim **5** including a drive gear on said output shaft,
a driven gear on said conveyor input shaft,
and said drive and driven gears intermeshing despite changes of arcuate position of said driven gear around said drive gear.

7. A stacker as set forth in claim **1** wherein said control means controls a selected number of said plurality of supports in a group adjacent to and upstream from said stop means, and said selected number of supports having a dimension parallel to said direction of movement of the pieces approximately equal to the length of the piece being conveyed.

8. A stacker as set forth in claim **1** wherein said stop means has first and second portions,
said first portion facing upstream and disposed transversely to said pass plane to be engaged by the down-

stream end of any of the pieces diverted from said pass plane,

said second portion having a component generally parallel to said pass plane and displaced therefrom to be disposed generally horizontally,

the upstream end of the pieces falling onto a stack upon being diverted from said pass plane,

the downstream end of the pieces being supported on said second portion of said stop means to support the pieces at an angle to the horizontal,

and means to relatively move said first and second portions of said stop means to move a piece upstream toward alignment on the stack of pieces and to terminate the support of the downstream end of the piece on said second portion to permit the downstream end to fall onto the stack in alignment therewith.

9. A stacker as set forth in claim **8** wherein said means to relatively move said first and second portions of said stop means includes means to move said first portion of said stop means slowly upstream to position a piece on the stack of pieces, and means to move said second portion from a generally horizontal position to a generally vertical position to drop the piece.

10. A stacker as set forth in claim **1** wherein said stop means includes an end stop device, and shock absorber means on said stop device to absorb the force of a piece striking said end stop device as it moves downstream and is dropped by said plurality of supports.

11. A stacker as set forth in claim **10** including fluid power means on said end stop device to move same slowly upstream to push pieces upstream to precisely position each of the pieces on a stack with the downstream end of each of the pieces aligned at said end stop device.

12. A stacker as set forth in claim **1** including an end stop device as part of said stop means,

a shelf on said end stop device to support the downstream end of any of said pieces above the stack while permitting the upstream end of any of said pieces to frictionally engage the stack to thus support such pieces at an angle to the horizontal.

power means to move said end stop device upstream to position any of the pieces,

and means to retract said shelf relative to said end stop device to permit the downstream end of any of said pieces to drop onto the stack.

13. A stacker as set forth in claim **12** wherein said power means is fluid power means to move said end stop device slowly upstream to precisely position any of said pieces,

and said shelf being pivoted on said end stop device with first and second positions,

said first position of said shelf being generally horizontal and said second position of said shelf being generally vertically downward,

means to establish said shelf in said first position to support the downstream end of any of said pieces as said fluid power means moves said pieces slowly upstream,

and means to move said shelf to said second position to drop the downstream end of any said pieces into position on the stack.

14. A stacker as set forth in claim **1**, including power means to move said stop means upstream to position each of said pieces on a stack,

a pivoted shelf on said stop means having first and second positions,

said first position of said shelf being generally horizontal and said second position of said shelf being generally vertically downward,

means to establish said shelf in said first position with said power means moving said piece upstream,

and means to move said shelf to said second position to drop the downstream end of said piece into position on the stack.

15. A stacker as set form in claim **1**, including program means to selectively control said first and second condition of said plurality of supports.

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U.S. Cl. X.R.

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