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McLane

[11] **3,808,663**

[45] **May 7, 1974**

[54] **ALIGNING MECHANISM FOR BATTERY GRID CASTING MACHINE**

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[73] Assignee: **Wirtz Manufacturing Company, Inc.**, Port Huron, Mich.

[22] Filed: **Sept. 11, 1972**

[21] Appl. No.: **287,774**

[52] **U.S. Cl.** **29/204**

[51] **Int. Cl.** **H01m 35/18**

[58] **Field of Search**.. 29/204, 204 R, 204 D, 208 R, 29/200 A

[56] **References Cited**

UNITED STATES PATENTS

3,508,318 4/1970 Clingenpeel et al. 29/204

Primary Examiner—Thomas H. Eager

Attorney, Agent, or Firm—Barnes, Kisselle, Raisch & Choate

[57] **ABSTRACT**

A battery grid casting machine which includes a grid trimming die and means for properly aligning the grid with the die. The latter means includes a belt conveyor adapted to direct the cast grid onto a horizontally disposed pallet which in turn pivots downwardly so that the grid gravitates to a position wherein lugs at the leading edge thereof engage a stop which properly aligns the grid before the stop is retracted to feed the grid into the trimming die.

11 Claims, 5 Drawing Figures

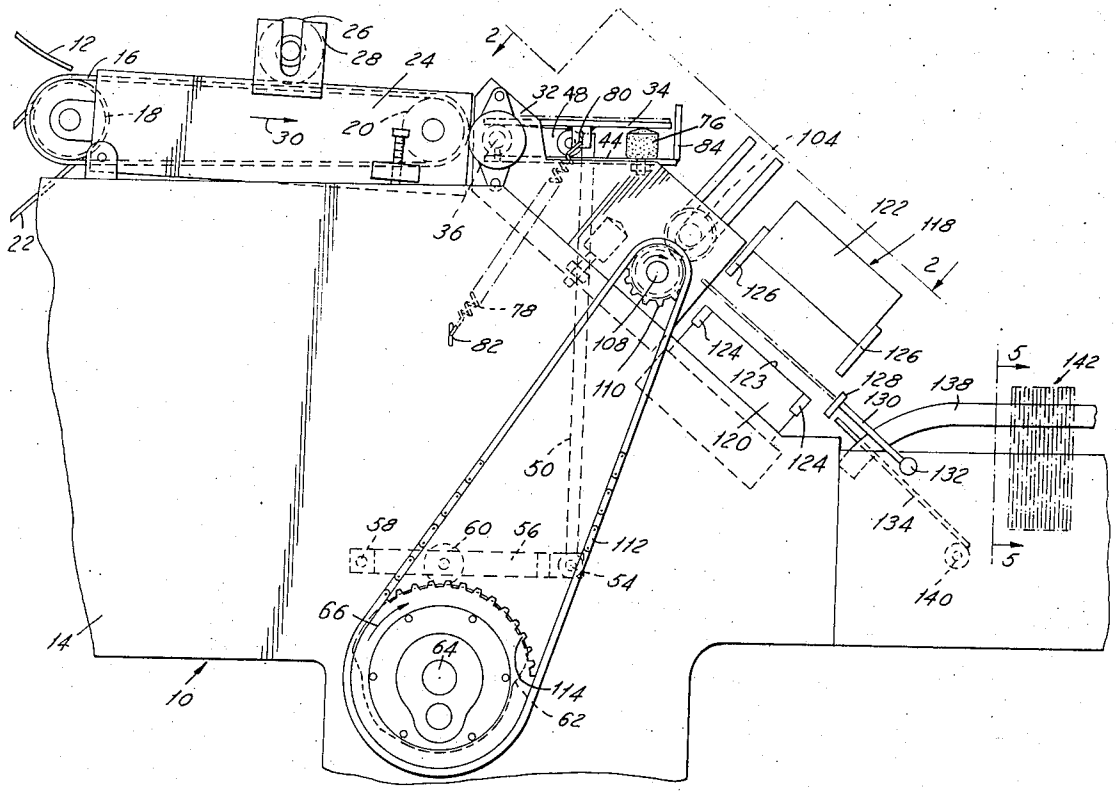

FIG. 1

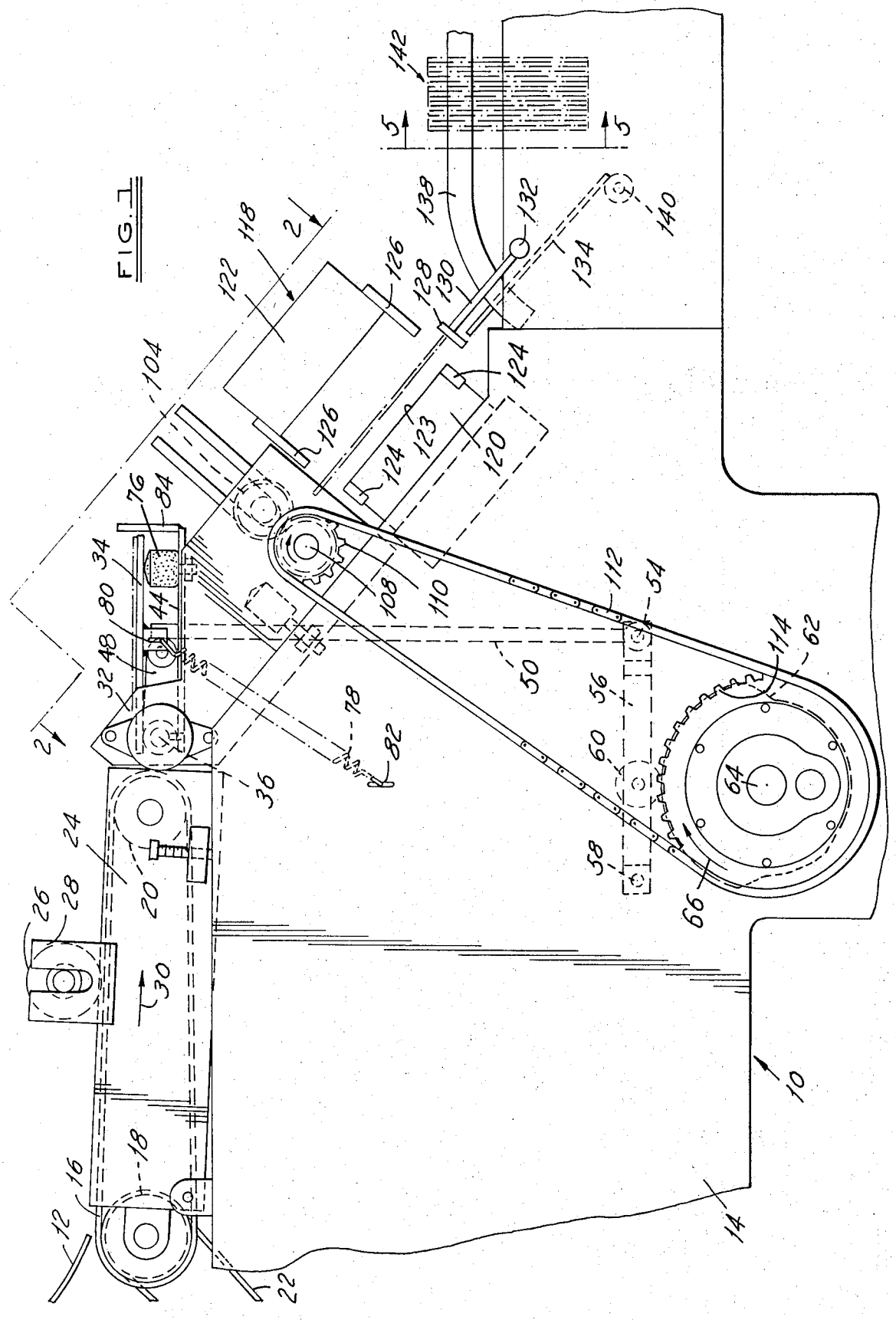
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FIG. 2

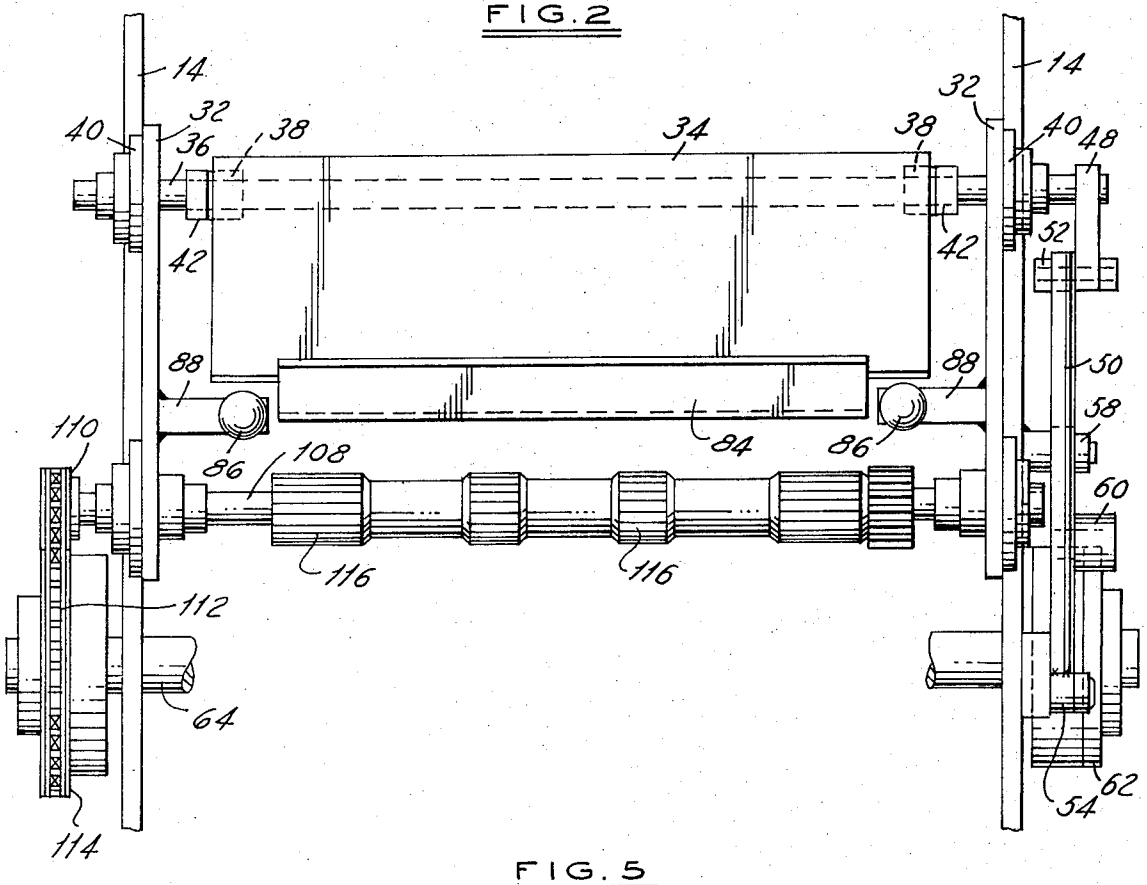
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FIG. 5

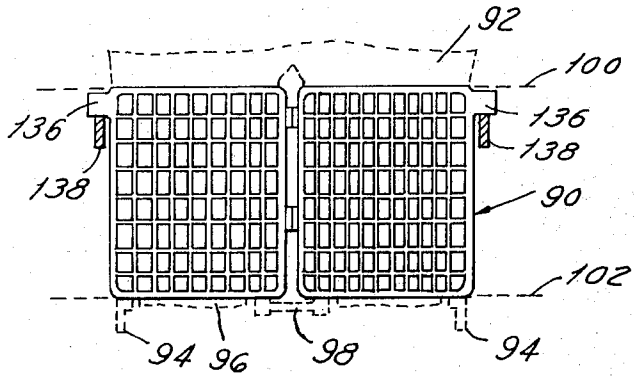
92
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FIG. 3

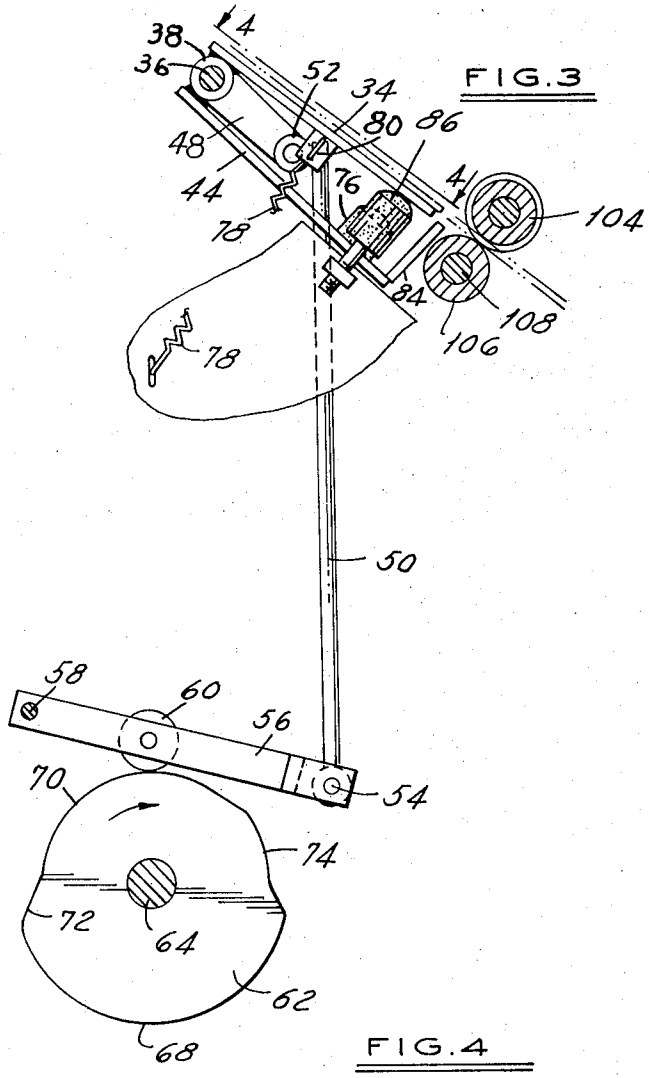
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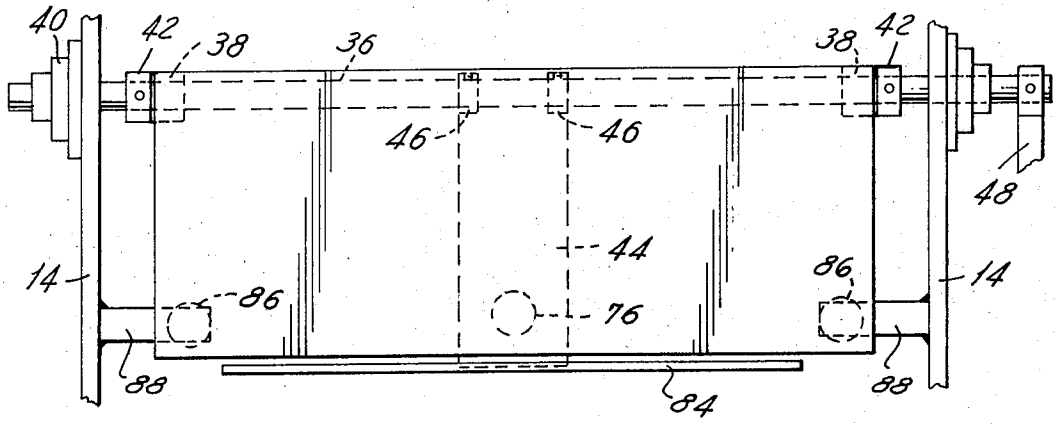
FIG. 4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ALIGNING MECHANISM FOR BATTERY GRID CASTING MACHINE

This invention relates to a machine for the manufacture of battery grids and, more specifically, to a mechanism for properly aligning the cast grid with a grid trimming die.

Battery grids are normally cast with projecting portions at the upper and lower edges thereof which extend outwardly beyond the finished dimensions of the grid. These excess metal portions are formed on the grid as cast in portions of the mold cavity which are required, such as for gates, vents, shrink lugs, etc. After casting and while the grid is still quite hot and relatively fragile, it is customary to convey the grid to a trimming die where the abovementioned projecting portions are sheared off to trim the grid to its finished dimensions. In order to obtain properly sized and properly shaped grids it is essential that the grid be correctly aligned with the die. In the process of aligning the grid for entry into the die it is important that its movement be arrested gently since it is still sufficiently hot as to be relatively fragile.

The present invention has for its primary object a mechanism for engaging a cast grid as it is released from the mold, gently arresting its speed of travel while directing it onto a support pallet and then tilting the pallet to properly align the grid and to permit it to gravitate toward the trimming die.

A further object of the invention is to utilize relatively heavy lugs on the leading edge of the cast grid for engaging an alignment stop associated with the pallet so as to at least momentarily arrest movement of the grid for the purpose of alignment, the lugs being located on the cast grid so as to be sheared off in the trimming die.

Other objects and features of the present invention will become apparent from the following description and drawings, in which:

FIG. 1 is a fragmentary side elevational view of a grid casting machine incorporating the present invention;

FIG. 2 is a fragmentary sectional view taken along line 2—2 in FIG. 1;

FIG. 3 is a fragmentary view, partly in section, showing the manner in which the grid aligning mechanism is actuated;

FIG. 4 is a fragmentary sectional view taken along line 4—4 in FIG. 3; and

FIG. 5 is a fragmentary sectional view taken along line 5—5 in FIG. 1 and showing in broken lines the portions of the grid as cast which are sheared off in the trimming die.

Referring to the drawings and particularly to FIG. 1, there is illustrated a portion of a battery grid casting machine **10** which includes a slide **12** extending downwardly directly from beneath the mold of the machine and onto which cast grids, while still relatively hot, are adapted to fall after the mold is opened and the grid is ejected. Since the mold may be of the conventional type which includes separable sections, it need not be illustrated or further described. The grid aligning and trimming mechanism is supported on the frame of the machine which includes a pair of side walls **14**. Slide **12** is of arcuate shape and curves downwardly so that its lower end overlies the upper run of an endless conveyor belt **16**. Belt **16** is trained around two rollers **18** and **20**. Roller **18** is continuously driven from a power source on the machine, as by a belt or chain **22**. Guide plates **24** are mounted along each side of conveyor belt **16** and project upwardly slightly above the upper run of belt **16** so as to cooperate with the conveyor belt to form a guideway for the grids. A weighted steel roller **26** extends across and is supported on the upper run of belt **16**. The opposite ends of roller **26** are guided for vertical movement in brackets **28**. The upper run of belt **16** is supported on the underside thereof by suitable means (not shown) to prevent the weight of roller **26** from causing the belt to sag. Roller **18** is driven so that the upper run of the belt travels in the direction indicated by arrow **30** in FIG. **1**.

Adjacent the discharge end of conveyor belt **16** there is mounted on side walls **14** of the machine a pair of side plates **32** on which the alignment mechanism about to be described is mounted. This alignment mechanism includes a flat pallet **34** journalled on a shaft **36** by means of a pair of bushings **38** welded to the underside of pallet **34**. Shaft **36** is journalled on side plates **32** by bearings **40** and pallet **34** is prevented from shifting axially on shaft **36** by a pair of collars **42** fixed to the shaft in a suitable manner and abutting the axially outer faces of bushings **38**. A support bracket **44** (see FIGS. **1** and **4**) underlies pallet **34** and has a pair of bushings **46** welded or otherwise fixedly attached to the upper face thereof. Shaft **36** extends through bushings **46** and the bushings are fixed to the shaft by set screws or the like so that shaft **36** and bracket **44** rotate as a unit while pallet **34** is permitted to pivot freely on shaft **36**.

At one end thereof (see FIG. **2**) shaft **36** has a crank **48** pinned or otherwise fixed thereto. A generally vertically extending link **50** has its upper end pivotally connected to the free end of crank **48** as by a bushing **52**. The lower end of link **50** is pivotally connected as at **54** to the free end of a crank arm **56** which is supported for swinging movement about a fixed pivot **58**. The intermediate portion of arm **56** carries a cam follower **60** which rides on the outer periphery of a cam **62** fixed to a shaft **64**. Shaft **64** is positively driven in the direction shown by the arrow **66** from a suitable drive mechanism on the machine (not shown).

The periphery of cam **62** comprises a cam track having an outermost portion **68** concentric with the axis of rotation of shaft **64** and an innermost portion **70** which is also concentric to the axis of rotation of shaft **64**. A cam rise portion **72** connects one pair of the adjacent ends of cam track portions **68** and **70**. The cam track also includes a third portion **74** which is concentric to the axis of rotation of shaft **64** and which is disposed radially between portions **68** and **70**. It will be observed that the circumferential extent of portion **74** is substantially shorter than the circumferential extents of portions **68,70**. When cam follower **60** is riding on the high side **68** of cam **62** bracket **44** is in the position shown in FIG. **1**. When cam follower **60** is riding on the low side **70** of cam **62** bracket **44** is disposed in the downwardly inclined position shown in FIG. **3**.

A rubber bumper **76** is fixedly mounted on the top side of bracket **44** so that the upper end thereof is normally engaged by the underside of a pallet **34**. If desired, a spring **78** may have one end thereof attached to pallet **34** as at **80** and the other end thereof fixedly anchored as at **82** in order to prevent any bouncing action between pallet **34** and bracket **44**. Bumper **76** serves as a spacer between pallet **34** and bracket **44** to

maintain these two elements in generally parallel relation. The free end of bracket **44** has an upstanding stop **84** fixedly mounted thereon. In the position of the various elements shown in FIG. **1** stop **84** projects upwardly above the plane of pallet **34.**

Each side wall **14** has an abutment or bumper **86** mounted thereon as by a bracket **88.** Abutments **86** are located so as to engage the underside of pallet **34** adjacent the outer corners thereof at the leading free edge of the pallet as cam follower **60** rides off the high side **68** of the cam onto the low side **70** of cam **62.** As shown in FIG. **3,** when cam follower **60** is riding on the low side **70** of cam **62** bracket **44** has been pivoted to a downwardly inclined position wherein pivotal movement of pallet **34** is arrested by stops **86** while bumper **76** on bracket **44** is spaced downwardly below pallet **34.** It will be further observed that in this position bracket **44** has been pivoted downwardly sufficiently to cause upright stop **84** to be retracted to a position below the plane of pallet **34.**

It should be pointed out at this time that the cam track portion **74** is designed such that, when cam follower **60** rides off the cam track portion **68** onto the cam track portion **74,** bracket **44** is pivoted downwardly to a position above that shown in FIG. **3** wherein bumper **76** is still in engagement with the underside of pallet **34.** As a result, pallet **34** is pivoted downwardly to permit the grid thereon to slide downwardly to a position wherein the grid is still in contact with stop **84.** The circumferential or arcuate extent of cam track portion **74** is sufficient to enable the grid to stabilize itself against stop **84** before the stop is retracted to the position illustrated in FIG. **3.**

For a better understanding of the action which occurs on pallet **34** so as to properly align the grid reference to FIG. **5** is helpful. In FIG. **5** the grid is designated **90.** In the as cast condition the grid includes the portions shown in broken lines in FIG. **5.** This includes a gate portion **92** at the upper or trailing end of the grid and heavy lugs **94** at the leading or lower end of the grid. Adjacent the lugs **94** the grid may also include relatively thin short sections of flash **96** and a sprue section **98.** It is the lugs **94** that are adapted to abut against stop **84** so that the grid will be properly aligned with respect to the hereinafter shearing die which is adapted to trim off the sections **92,94,96,98** along the two shear lines **100** and **102.**

Just beyond the lower end of pallet **34** and in line therewith when the pallet is in the downwardly inclined position shown in FIG. **3** there is located a pair of feed rolls **104,106.** Roll **106** is keyed to a shaft **108** which has a sprocket **110** fixedly mounted at one end thereof, as shown in FIG. **2.** A chain **112** connects sprocket **110** with a sprocket **114** fixed to shaft **64.** The upper roll **104** simply rests on roll **106** in tangential contact therewith. Rolls **104,106** have serrated surfaces as indicated at **116** so as to frictionally engage the grid as its leading end slides off pallet **34** when stop **84** is retracted to the position shown in FIG. **3.** Roll **106** is power driven at a speed such as to gently direct the grid into the inclined trimming die which is generally designated **118** in FIG. **1.**

Die **118** has a stationary lower section **120** and a vertically reciprocating upper section **122.** Lower section **120** has a grid support surface **123** generally parallel to the plane of pallet **34** when the latter is in the position in FIG. **3.** These two die sections are provided with two pair of cooperating shear members **124,126** which are spaced apart a distance corresponding to the spacing between shear lines **100** and **102** in FIG. **5.** Upper die section **122** is reciprocated by a suitable mechanism (not shown) in synchronism with the operation of pallet **34.** As the grid is directed into the die by feed rolls **104,106,** lugs **94** at the leading end thereof engage a stop plate **128** to properly locate the grid in the die relative to shear members **124,126.** Stop **128** is carried on an arm **130** which is pivoted as at **132.** Arm **130** is actuated to swing upwardly out of the way of the grid after the die closes so that when the die opens the trimmed grid will slide onto a support plate **134.** As shown in FIG. **5,** the grid is also formed with a pair of laterally extending lugs **136** which, when the grid slides onto plate **134,** engages rails **138.** Thereafter plate **134,** which is pivotally supported as at **140,** pivots clockwise as viewed in FIG. **1** to slide the grid along rails **138** and stack the same in a vertically suspended position as indicated at **142.**

The operation of the device is apparent from the preceding description. When the grid casting mold sections are separated the hot grid is ejected therefrom and falls onto slide **12** with the lugs **94** foremost. When the grid reaches the lower end of slide **12** it is engaged by the upper run of belt **16** and advanced in the direction of arrow **30** in FIG. **1.** Roller **26** bears down on the grid as it is conveyed thereunder to flatten it in the event that it is slightly bowed. As the leading end of the grid travels past roller **20** the grid is deposited on pallet **34.** However at this point the central longitudinal axis of the grid will probably not be accurately aligned with the path of travel. Normally the grid will be slightly cocked as it is deposited on pallet **34.** However, immediately after the grid is deposited on pallet **34** from the discharge end of conveyor belt **16** cam follower **60** (which is riding on the high side **68** of the cam) gradually drops to the intermediate portion **74** of the cam track to tilt pallet **34** downwardly so that the grid slides downwardly on the pallet to a position wherein both lugs **94** engage stop plate **84.** The grid remains in this position engaging stop **84** momentarily before cam follower **60** encounters the low side **70** of the cam which results in a retraction of stop **84** to the position shown in FIG. **3.** This permits the grid to be engaged by the feed rolls **104,106** which direct the grid into the die at the proper speed as previously described.

I claim:

1. In a battery grid casting machine of the type adapted to produce a pair of laterally spaced, relatively heavy lugs projecting forwardly from the leading end of the grid as cast, the combination of a power driven conveyor having a generally horizontally disposed grid support onto which the cast grids are directed after being ejected from the casting mold, said conveyor being adapted to advance the grids, leading edge foremost, at a predetermined speed, a grid supporting pallet disposed adjacent the discharge end of said conveyor and onto which the grids are adapted to be discharged by the conveyor, said pallet being supported for pivotal movement about a horizontally extending axis from a position in a generally horizontal plane to a position inclined downwardly and forwardly in the direction of travel of the grid from the conveyor, means for pivoting said pallet between said two positions comprising a pivoted support bracket underlying said pallet, spacer means projecting upwardly on said bracket and engage-

able with said pallet to support the same in a position spaced above the bracket, means for pivoting said support bracket downwardly from a position wherein said pallet is supported by said spacer means on the bracket in said horizontal plane so that the pallet pivots downwardly in response to downward pivotal movement of said bracket, an abutment fixedly supported on said machine for limiting downward pivotal movement of the pallet to said downwardly inclined position, a stop member on said bracket which, when the pallet is supported by the spacer means on the bracket, projects upwardly beyond the plane of the pallet adjacent the leading end thereof, said stop member being adapted to be abutted by the lugs on the grid when the pallet pivots downwardly so as to align the grid relative to the shear members of the hereinafter mentioned trim die, said means for pivoting said bracket being adapted to pivot the bracket downwardly beyond the position assumed by the pallet when the latter is in engagement with said abutment to retract said stop member downwardly below the plane of the pallet whereby to permit the grid supported thereon to gravitate downwardly on the pallet, and a trimming die disposed beyond the leading end of the pallet and into which the grid is adapted to be discharged, said die having a grid supporting surface inclined generally parallel to the plane of the inclined pallet and having shear members extending transversely of the path of travel of the grid for trimming off the leading and trailing edges of the grid.

2. The combination called for in claim **1** wherein the means for pivoting said bracket are adapted to at least momentarily retain said stop in a position projecting above the plane of the pallet when the pallet engages said abutment.

3. The combination called for in claim **1** wherein said means for pivoting said bracket includes a cam having a cam track, a cam follower interconnecting said bracket and cam track, said cam track having a portion for retaining said stop member in a position projecting upwardly of the plane of the pallet for a predetermined time period after the pallet engages said abutment whereby to permit the grid to assume a fixed position on said pallet before the abutment is retracted.

4. The combination called for in claim **1** wherein the pivotal axis of said bracket coincides with the pivotal axis of said pallet.

5. The combination called for in claim **1** wherein said conveyor comprises an endless belt, the top run of which comprises said grid support surface, a weighted roller gravitationally supported on the top run of the belt so that the grids conveyed by the conveyor are caused to travel between said roller and the top run of the belt.

6. The combination called for in claim **1** including a pair of peripherally engaged feed rolls disposed between said pallet and die and positioned to engage each grid as it is released from the inclined pallet and feed the grids at a controlled rate of speed into the trimming die.

7. The combination called for in claim **1** wherein said means for pivoting said bracket comprises a shaft journalled for rotation about a fixed axis adjacent the discharge end of the conveyor, said bracket being fixed to said shaft to rotate therewith, a crank fixed to said shaft and means for swinging the crank in opposite directions to pivot the bracket upwardly and downwardly about the axis of the shaft.

8. The combination called for in claim **7** wherein the means for swinging the crank comprises a rotary cam having a cam track, a cam follower engaging the cam track and a link interconnecting the cam follower with the crank.

9. The combination called for in claim **8** wherein said cam track has a first portion concentric with the axis of rotation of the cam for maintaining the pallet in said horizontal position, a second portion concentric with the axis of rotation of the cam for maintaining the bracket in said position wherein said stop is retracted to a position below the plane of the pallet and a third portion for retaining the stop in a position projecting above the plane of the pallet for a predetermined time period after the pallet engages said abutment.

10. The combination called for in claim **9** wherein said third portion is concentric with the axis of rotation of the cam.

11. The combination called for in claim **10** wherein said third portion of the cam track is located radially intermediate the first and second portions.

* * * * *

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,808,663 Dated May 7, 1974

Inventor(s) Jack E. McLane

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 5, Line 43 Cancel "abutment" and insert in place thereof -- stop member --

Column 6, Line 33 After "stop" insert -- member --

Line 35 After "stop" insert -- member --

Signed and sealed this 12th day of November 1974.

(SEAL)
Attest:

McCOY M. GIBSON JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents