Jan. 1, 1963 C. A. DAVIS 3,071,291

NAILING MACHINE FEED MECHANISM

Filed Feb. 20, 1959 2 Sheets-Sheet 1

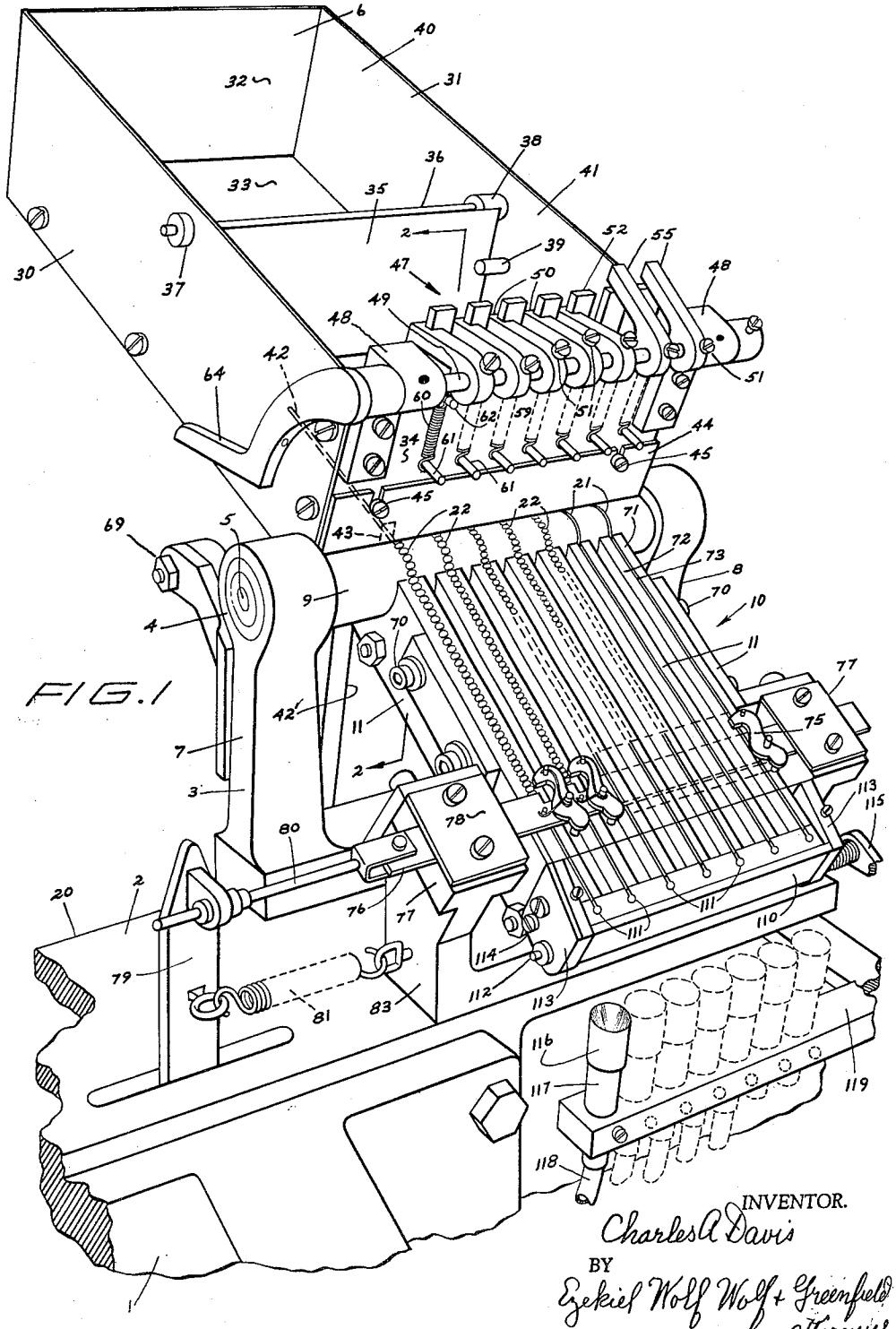


FIG. 1

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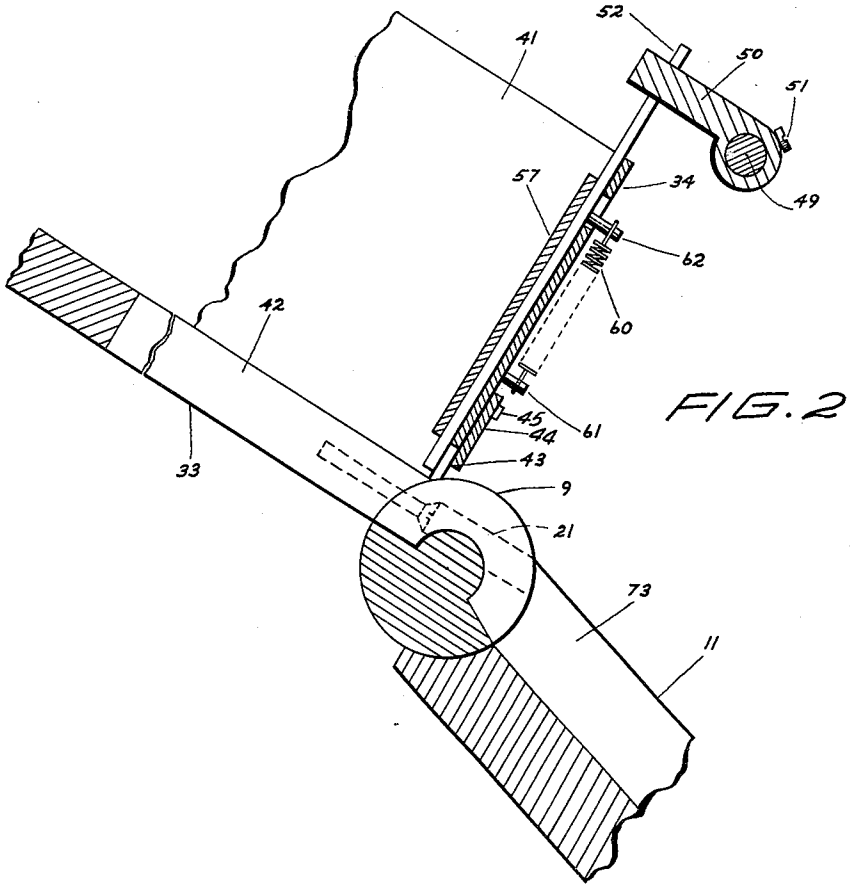


FIG. 2

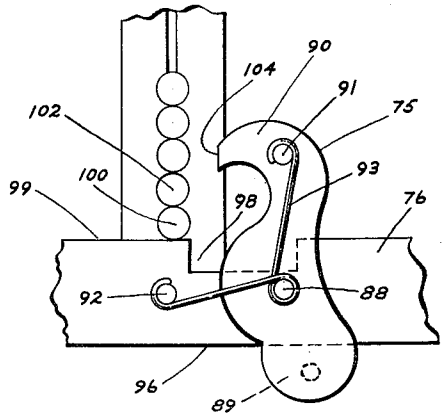


FIG. 3

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NAILING MACHINE FEED MECHANISM

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The present invention relates to a feed mechanism, particularly adapted for use as part of a nailing machine.

In automatic nailing machines, and in particular in nailing machines designed for use in the shoe industry, it is desirable to provide a feed mechanism for feeding several nails simultaneously to the nailing mechanism.

In the shoe industry, such a device has particular utility for nailing heels to shoes where four or more nails are customarily driven into the heel at the same time.

One of the principal problems encountered in nailing machines of this type is the problem of supplying nails to the nailing mechanism in selected numbers, orientation, and at uniform time intervals in regular uninterrupted cycles.

Heretofore mechanism designed to supply nails in groups oriented in a selected manner have not operated in an altogether satisfactory manner. In many of the machines heretofore in use the feed mechanism jams, the nails fail to pass through the mechanism in uniform numbers or the feed mechanism malfunctions in some other fashion.

Certain machines have been designed which apparently do function in a relatively smooth fashion. These machines however are extremely expensive in nature and consequently are beyond the purchasing power of many marginally operating factories in need of many such machines.

It is therefore an object of the present invention to provide a nailing machine feed mechanism adapted to be incorporated into the nailing machine which is certain of operation over prolonged periods of time and which is relatively inexpensive with respect to original cost and maintenance.

It is also an object of the present invention to provide a feed mechanism for nailing machines adapted to operate with a high degree of efficiency and in a relatively rapid rate, limited only by the rate of speed at which the nailing process of the nailing machine is effected.

Another object of the present invention is to provide a feed mechanism having a hopper to receive nails in random arrangement with means associated with the hopper to limit the amount of nails being fed to the mouth of the hopper.

Another object of the present invention is to provide a mechanism incorporating moveable gates at the mouth of the hopper adapted to be actuated to free jammed nails in this area.

A still further object of the present invention is to provide a pawl and rack arrangement of improved design adapted to separate a leading nail in each of several columns of nails from the columns themselves for further movement to the nailing mechanism.

These and other objects and advantages of the present invention will be more clearly understood from a consideration of the accompanying drawing, in which:

FIG. 1 is a perspective view of the feed mechanism of the present invention shown mounted on the nailing machine with the nailing machine shown in fragmentary form.

FIG. 2 is a cross sectional detail of the gate mechanism, and,

FIG. 3 is an enlarged plan detail of the pawl and rack mechanism.

The feed mechanism is adapted to be mounted on a machine 1 designed for simultaneous nailing of a plurality of nails. In particular the feed mechanism is adapted to be used in conjunction with the heel nailing machine. The mechanism is supported on a frame 2, suitably secured in any fashion to the machine 1. This frame preferably provides a horizontal flat surface. At the rear edge 20 of the frame, there is secured by bolts or other suitable means, a support 3. This support 3 is formed with parallel opposed vertically extending legs 7 having enlarged upper ends with each end having fixed therein aligned journals 4. Axially supported within these journals at its ends is a shaft 5 having intermediate the journals an enlarged center portion 9 with a series of parallel slots 21, spaced apart and coincident with chutes 11 more completely described hereinafter. The slots have a depth sufficient to accommodate the length of the nails 22 which are being fed through the feed mechanism and which pass through these slots 21. The shaft 5 is adapted to be reciprocally rotated about the axis of the shaft 5. Rigidly secured to shaft 5 and adapted to be reciprocally rotated with it, is the hopper 6, having side walls 30 and 31, rear wall 32, bottom 33 and forward wall 34, continuous with one another to form a rectangular open top container. The bottom 33 of the hopper is of substantial thickness, as for example ½". The forward end of this bottom 33 is arcuately curved to conform to the shaft and is secured to it by screws diametrically passing through the shaft. Mounted within the hopper 6 is a baffle 35 formed of a rectangular plate. This baffle 35 is mounted at its upper edge on a rotatable shaft 36 pivotally journaled at its ends in journals 37 and 38, in turn respectively secured to the side walls 30 and 31. The baffle extends downwardly towards the bottom 33 and terminates above this bottom 33, when normal to it, a distance somewhat less than the diameter of the nail heads being used. A stop 39 projects inwardly from the inner surface of side wall 311 forward or baffle 35 and is adapted to engage the baffle 35 when the hopper 6 is in the tilted position illustrated. When the hopper 6 is in such tilted position, the baffle 35 is inclined at its lower edge towards the forward wall 34 and the distance between the lower edge of the baffle 35 and the bottom 33 is slightly greater than the diameter of the nail heads used. Thus as the hopper 6 is moved from a horizontal to an inclined position as illustrated in the drawing, the baffle 35 will pivot forwardly on the shaft 36 to permit passage of a certain quantity of nails from the rear portion of the hopper indicated at 40 to the forward portion of the hopper indicated at 41, with these nails passing underneath the baffle 35. When the hopper 6 is pivoted from the position illustrated to a horizontal position in a manner hereinafter described, the baffle 35 will pivot to a normal position with the bottom 33, thereby closing the gap between its lower edge and the bottom 33 to prevent the return of nails from the section 41 to the section 40. Thus if a quantity of nails are placed in section 40, a certain limited number will pass from section 40 into section 41 upon each reciprocal movement of the hopper 6.

The hopper 6 is reciprocally moved from the horizontal position to the position illustrated and then back to a horizontal position by conventional means. Thus if desired, an actuating arm 42' pivotally engaging the lower surface of the bottom 3 and reciprocally moved from a drive source (not shown), operating off a cam arrangement may be used to affect this reciprocal movement of the hopper 6.

Forward section 41 is formed with a series of slots through the thickened bottom 33 with these slots parallel to one another and extending from the forward wall 34 rearwardly.

In the embodiment illustrated, seven such slots are

provided, each aligned with one of the slots **21** in the sleeve **9**. One of these slots is illustrated at **42** in dotted outline. These slots **42** have a width sufficient to receive the shank of nails contained within section **41**, but not their heads. Thus these nails will be agitated by the rocking motion of the hopper **6** until they fall into the slots **42**. As indicated the bottom **33** is sufficiently thick to act as a channel and prevent jamming. These nails are moved forwardly by the rocking motion of the hopper towards the lower edge of the forward **34**. They pass through slots illustrated at **43** in the forward wall **34** and drop into the slots **21** in the portion **9**. The height of the slots **43** are controlled by an adjustable plate **44** which extends across the forward wall **34** in facing relation to it and is secured to this forward wall by screws **45** passing through elongated slots in the plate **44** into the forward wall.

It has been found that unless suitable means are provided, the nails in the slots **42** will be jammed in the slots or openings **43** by free nails within the forward section **41**. For this reason a gate mechanism generally illustrated at **47** is provided. In this arrangement a pair of journals **48** are fixed in alignment at opposite side edges of the forward portion of the wall **34**. These journals rotatably support a shaft **49** on which is fixed a series of lever arms **50**. These lever arms may be secured to the shaft **49** by set screws **51**. These lever arms **50** project rearwardly and engage gates **52** at slots formed therein.

In the embodiment illustrated, seven sets of lever arms **50** and gates **52** are illustrated with one set for each slot **21**.

It will be noted that five of the gates have slots and are engaged by the lever arms, and two are not. The two which are not engaged by the lever arms, are in this example, inverted and are not in use. Thus the lever arms indicated at **55** are adjusted to close the gates to which they would otherwise be engaged so as to prevent passage of nails through the openings **43** with which these particular gates are associated. This arrangement is particularly useful where variation in the particular number of nails being supplied in each group is desired.

The gates **52** may be guided in parallel milled slots in the rear of the forward wall **34** with the gates retained in the slots by a backing plate **57** adapted to permit reciprocal movement of the gates on rotation of the shaft. Each gate is adapted on rotation of the shaft **49**, to be longitudinally displaced through the engagement of the lever arms **50**, thereby opening or closing the slots **43**. The gates **52** are normally maintained in a closed position with the lower edge of each gate positioned just above the bottom **33**, leaving sufficient passage for a single nail head.

The gates **52** are normally maintained in this position by spring means generally illustrated at **59**. In this arrangement, a helical spring **60** is rigidly secured at its lower end to a pin **61**, projecting forwardly from the forward wall **34**. The upper end of the spring is secured to a second pin **62**. This second pin **62** projects forwardly from the gate **52** through an elongated slot in the forward wall. Each gate is provided with a similar spring arrangement. The end of the shaft **49** has fixed to it a lever arm **64**, positioned parallel to and on the outside of side wall **30**. This lever arm **64** is adapted to be engaged by the fixed actuator arm **69**. Thus as the hopper is reciprocated towards the horizontal position, arm **64** engages arm **69**, thus rotating shaft **49**, in turn rotating lever arms **50** which lift gates **52**. When gates **52** are raised, the space between their lower edge and the bottom **33** is increased thus releasing any nails which may have jammed in the slots **43**. Actually, the hopper **6** and arm **42** are so arranged as to reciprocate to a point at which the rear wall is slightly lower than the forward wall, thus assuring that nails which are jammed and then released from slots **43**, will fall rearwardly and clear of the slots. Upon the return motion of hopper **6**, to the inclined position illustrated the gates **52** close under the tension of the springs **60**, thus effectively barring, in most instances, the engagement of nails which are free within the forward section **41** in the slot **43**.

This reciprocating hopper **6** and gate mechanism **47**, provides a constant flow of nails **22**, into the slots **21**. These nails slide from the slots **21** into chutes **11** in the raceway generally indicated at **10**. Each of the chutes **11** is identical in arrangement with each chute aligned with a slot **21**. The chutes are spaced one from another by spacers (not shown), which may comprise sleeves mounted on shafts secured at their ends at opposite sides of the outermost chutes by bolts or the like as illustrated at **70**. Each chute is formed with a U-shaped cross section providing side walls **71**, **72**, spaced apart a distance coincident with the width of slots **21**. The channels **73** formed by these side walls are adapted to receive the nails **22** as they slide downwardly from the slots **21**.

The rear edges of the chutes **11** are arcuately curved to coincide and bear against the shaft portion **9** so as to present a smooth bearing surface to the shaft portion.

Intermediate the ends of the chutes **11** and toward the lower end of the chutes, there is provided means for simultaneously isolating the lowermost nail in each column of nails in the channels **73**. This means comprises a series of pawls **75**, with one for each chute **11**. The pawls are pivotally mounted on a rack **76** which extends above and normal to the length of the chutes **11**. This rack **76** is mounted for longitudinal reciprocal movement within the bearing block **77** and retainer plates **78**. The rack **76** is actuated by the actuating arm **79**, projecting upwardly through the frame **2** and interconnected to the rack **76** by means of a rod **80**, fixed at one end to the arm **79** and pivotally engaged in the other to the rack **76**. The arm **79** may be positively actuated in one direction by a mechanism associated with the machine **1** and timed to coincide with the desired operation of this machine. The return mechanism for the arm **79** may comprise the helical spring **81** fixed at its ends between the supporting frame **83** on which the blocks **77** are mounted and the arm **79**. Each pawl **75** is pivotally mounted to the rack **76** by means of a pin **88**, rigidly secured to the rack. Each pawl **75** is formed of a flat member having a downwardly projecting boss **89** forward of rack **76** and an enlarged downwardly projecting head **90**, rearward of the rack **76**. Projecting upwardly from the upper surface of each pawl **75** is a pin **91**. In addition the pin **88** projects upwardly of the pawls **75**. Pins **92** project upwardly from the upper surface of rack **76** adjacent the pawls **75**. Wire springs **93** are looped about the pins **88** and are provided with two legs, respectively engaging the opposite sides of pins **91** and **92**. These springs tension the heads **90** into a rotating movement about the pins **88** and towards the pins **92**. This orientation is limited by engagement of the bosses **89** with the forward edge **96** of the rack **76**. Each pawl **75** is positioned immediately adjacent a recess **98** in the rear edge **99** of the rack **76**. The rack **76** and recesses **98** are related and positioned so that the recess **98** is positioned immediately to the right of each channel **73**, when the rack is not actuated by arm **79**, as viewed in FIG. 1. In this non-actuated position, the lower surface of the rack **76** is in surface contact with the upper surface of the chutes **11**. Thus in this position, the leading nail head as illustrated in FIG. 3 at **100**, is engaged by the rear edge **99** of the rack preventing this nail from moving further downwardly on the chute. The lower end of each chute **11** is stepped downwardly at a point just under the rack **76**. Thus as the rack **76** is moved to the left by the actuating arm **79**, each forward nail **100** will come into alignment with a recess **98** and move forward in the recess **98** until it drops into this stepped portion of the chute which is clear of the rack. The nail will move forwardly past the rack **76**, sliding downwardly along the inclined chute **11** towards the forward edge of the chute. The second-most nail in each chute **11**, illus-

trated at 102, is however retained in position above the rack 76 by engagement with the pawl 75. As the rack moves to the left and carries with it the pawl 75, the surface 104 of the enlarged head 90, engages the head of the nail 102, the pawl rotates in a clockwise direction against the tension of the spring 93, thus holding the nail 102 in position in the channel 73 under spring tension. As the rack 76 returns to its initial position under the tension of the spring 81, the pawl 75 will be returned towards its initial position, thus moving away from the nail 102 and thereby releasing it to slide into contact with the rear edge 99 of the rack 76.

A similar operation occurs in each channel. It will be noted however that each channel is individually operatively controlled and thus if jamming or difficulty occurs in one channel, it will not affect operation of the other channel.

At the lower end of the raceway 10, there is provided a transport 110. This transport comprises an elongated member having a series of slots with counter sunk heads in its rear edge, each aligned with and conforming to a channel 73, as is illustrated at 111. This transport 110 is fixed to a shaft 112, in turn journaled in end plates 113. The end plates 113 may conveniently be secured to the outer portions of the raceway 10 by suitable means such as screws 114 or by other like means. The shaft 112 is adapted to be rotated by an actuating means 115, which in turn may be actuated by operation of the machine 1, and in timed synchronism with it. The shaft 112 is adapted to rotate the transport 110 so that the slots 111 are pivoted from a position in longitudinal and continuous alignment with the channels 73 into a position substantially normal to the channels 73. In this second position, the slots 111 are downwardly inclined with the upper ends as viewed in FIG. 1 directly above a series of receptacles 116. When the transport is thus pivotally actuated, nails contained within the slots 111 will fall freely from the transport into the receptacles 116. These receptacles 116 may comprise a rigid tubular upper end 117 continuous with flexible tubes 118 with the upper ends 117 mounted in a suitable frame 119, in turn secured to the frame 2. The flexible tubes 118 may be connected in any suitable and known manner to the nailing machine which does not form a portion of this invention.

What is claimed is:

1. In a nailing machine feed mechanism,
a hopper having a forward wall with a plurality of slots at the base of said wall for the passage therethrough of nails,
a frame having a horizontally disposed shaft journaled for oscillating rotation,
means securing said hopper to said shaft for oscillating movement about a horizontal axis parallel with the plane of said slots,
a plurality of parallel plates each forming a gate for one of said slots,
means slidably mounting each gate in a plane parallel to and adjacent said forward wall for sliding reciprocal movement to and from a position over said slot whereby said slot will be alternately closed and opened,
a second rotatable shaft mounted on said hopper parallel to said first shaft,
a plurality of levers engaging said plates for opening said gates with each of said levers independently operatively connected to said second shaft,

a lever arm fixed to said second shaft and operatively engageable by said frame on oscillating movement of said hopper to a position in which the bottom of said hopper is below said slots,
and means for closing said gates when said bottom is above said slots.

2. A device as set forth in claim 1, wherein said closing means comprises helical springs each fixed at one end to said hopper and at the other to one of said gates.

3. A device as set forth in claim 1, wherein each of said slots is formed with an elongated extension in the bottom of said hopper in a direction normal to said forward wall.

4. A device as set forth in claim 3, wherein said elongated extension of said slot is formed with depending sidewalls coacting as guides for nails postitioned therebetween.

5. A device as set forth in claim 3 wherein said first mentioned shaft is formed with transversely extending nail-receiving slots each coincident with a corresponding slot at the base of said forward wall.

6. In a nailing machine feed mechanism,
a hopper having a forward wall with a plurality of slots at the base of the wall for the passage therethrough of nails,
means securing said hopper for oscillating movement about a horizontal axis parallel with the plane of said slots,
a plurality of parallel plates each forming a gate for a different one of said slots,
means slidably mounting each gate in a plane parallel to and adjacent said forward wall for sliding reciprocal movement to and from a position over said slot whereby said slot will be alternately closed and opened,
a rotatable shaft mounted on said hopper parallel to said horizontal axis,
a plurality of levers engaging said plates for opening said gates with each of said levers independently operatively connected to said shaft,
means engaging said shaft for operation thereof on oscillating movement of said hopper to a position in which the bottom of said hopper is below said slots,
and means for closing said gates when said bottom is above said slots.

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