

Oct. 10, 1944.

F. FLUCKINGER

2,359,904

GLUE SPREADING MACHINE

Filed Oct. 8, 1941

7 Sheets-Sheet 1

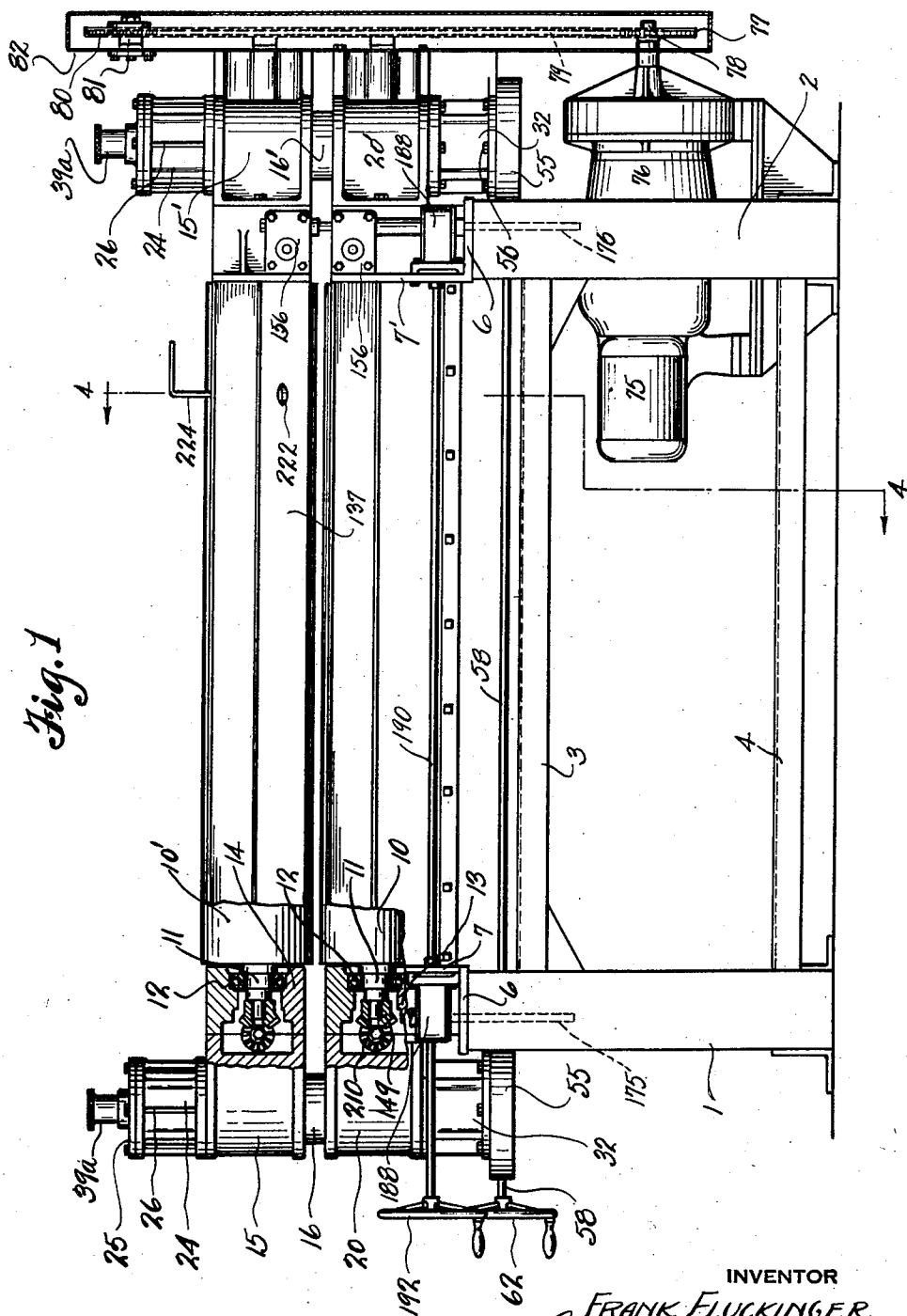


Fig. 1

INVENTOR

FRANK FLUCKINGER

BY

Cook & Robinson

ATTORNEY

Oct. 10, 1944.

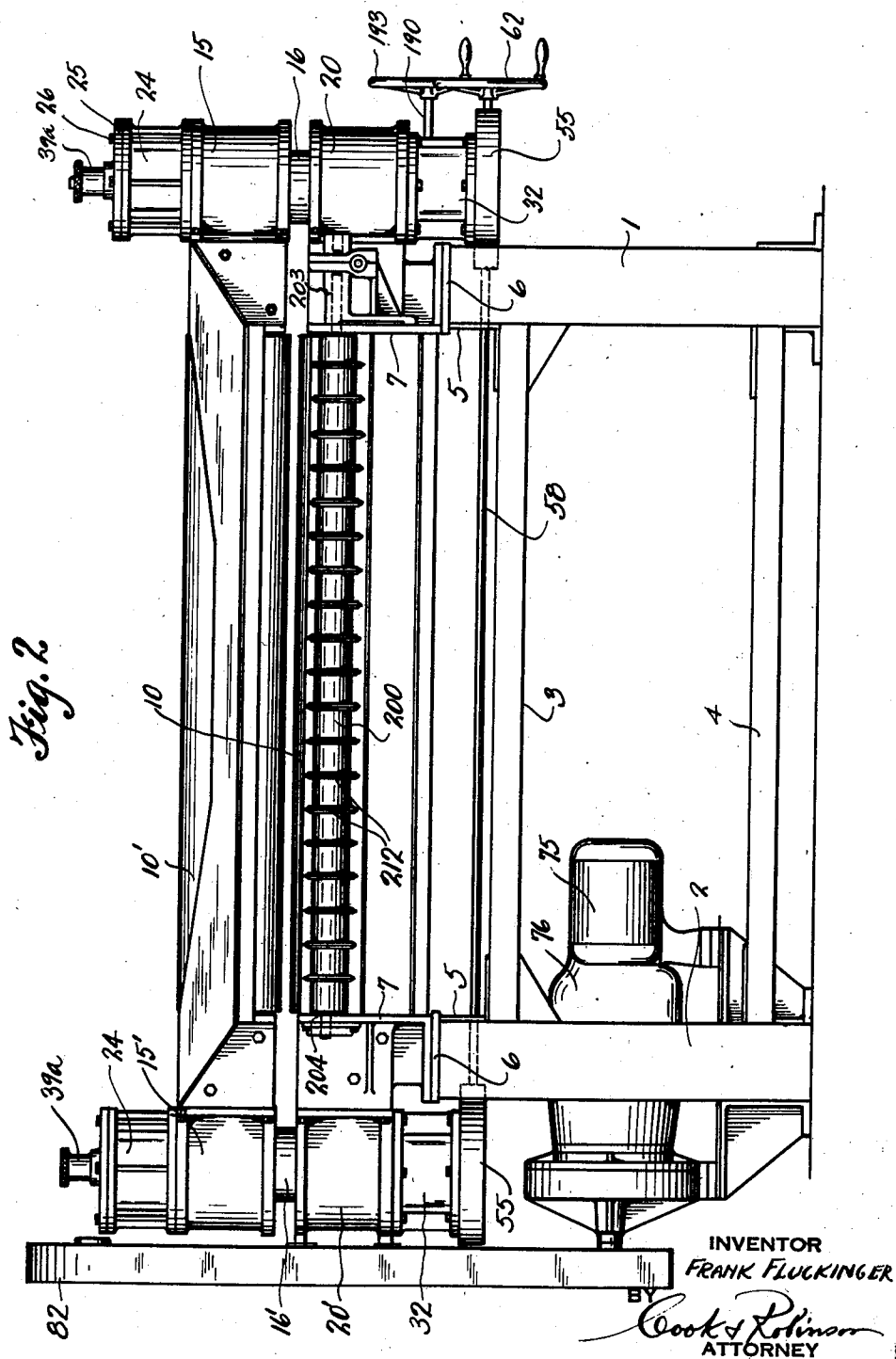
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GLUE SPREADING MACHINE

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7 Sheets-Sheet 2



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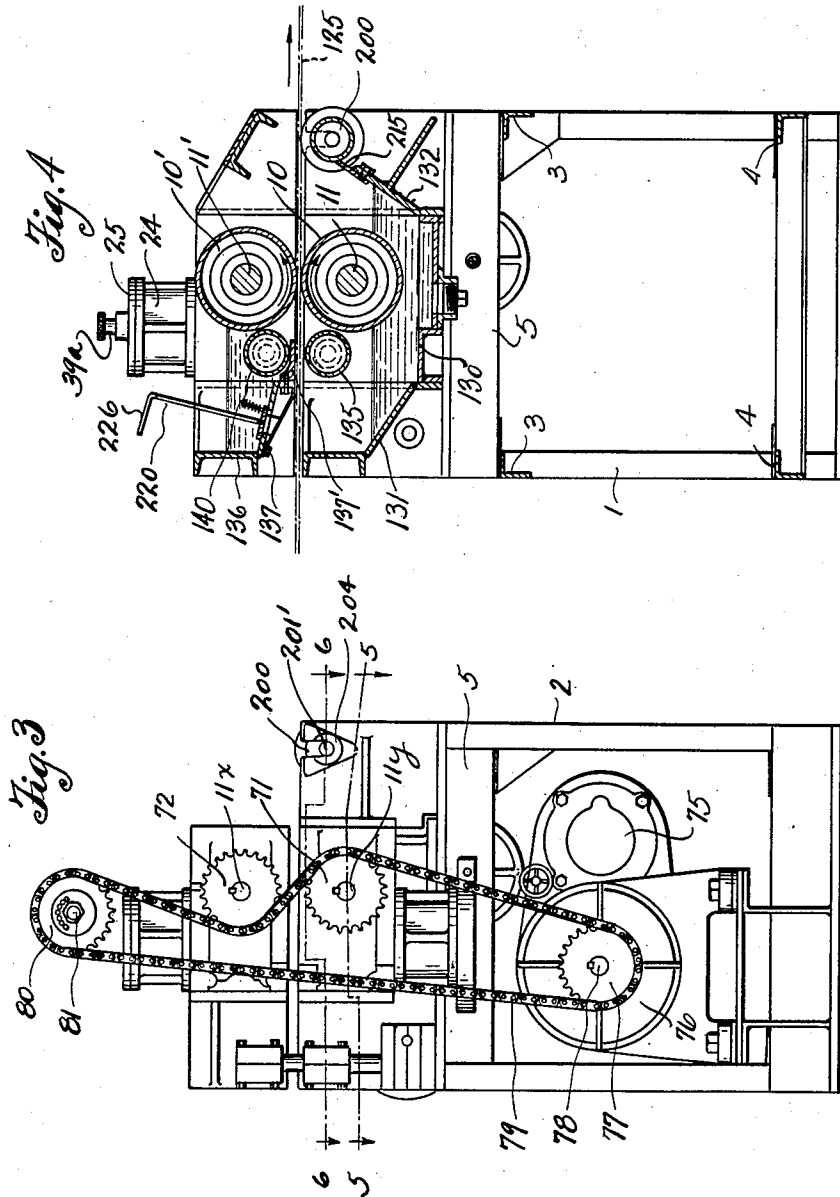
F. FLUCKINGER

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GLUE SPREADING MACHINE

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7 Sheets-Sheet 3



INVENTOR
FRANK FLUCKINGER

BY
CROOK & ROBINSON
ATTORNEY

Oct. 10, 1944.

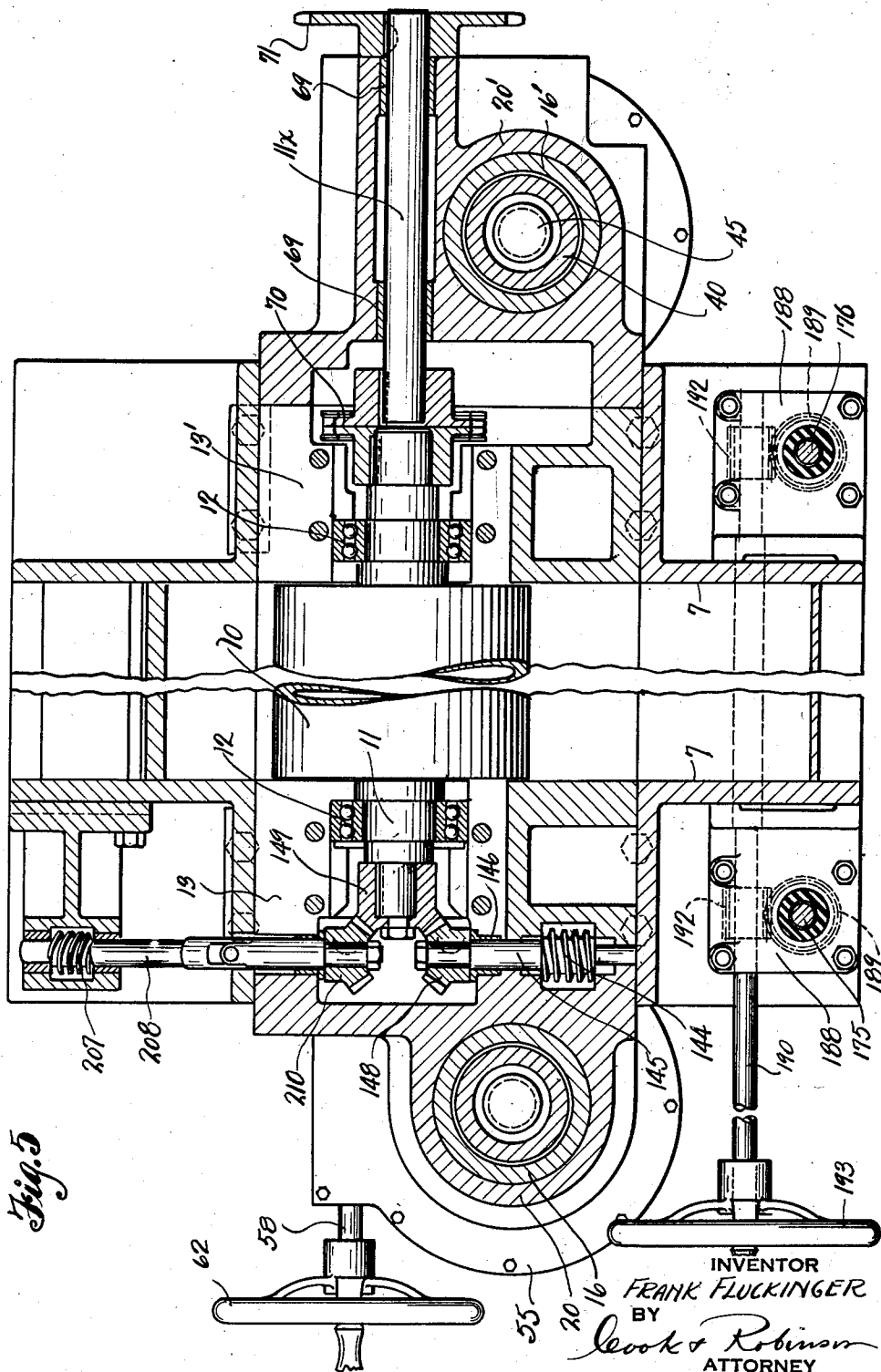
F. FLUCKINGER

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GLUE SPREADING MACHINE

Filed Oct. 8, 1941

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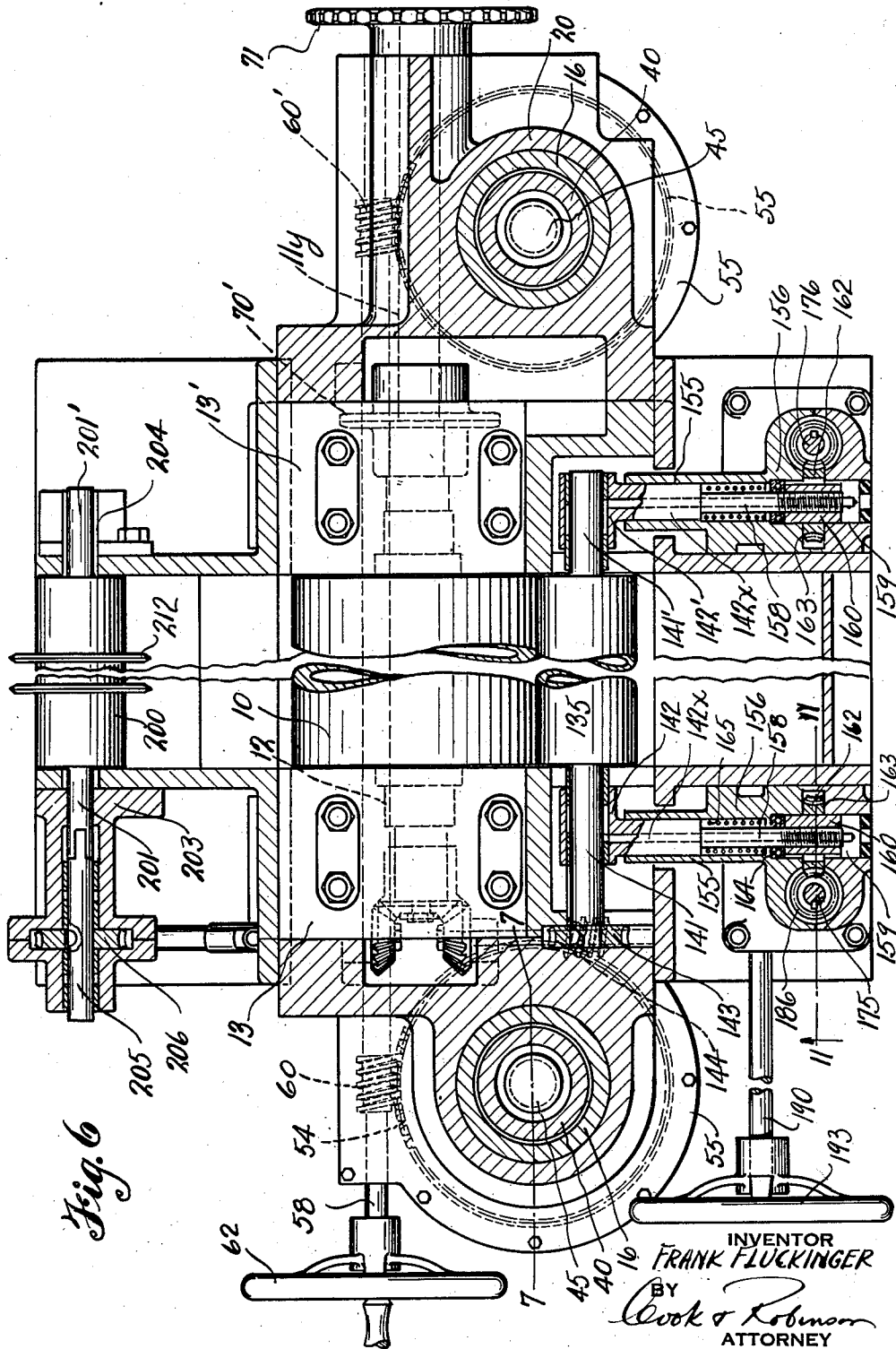
F. FLUCKINGER

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GLUE SPREADING MACHINE

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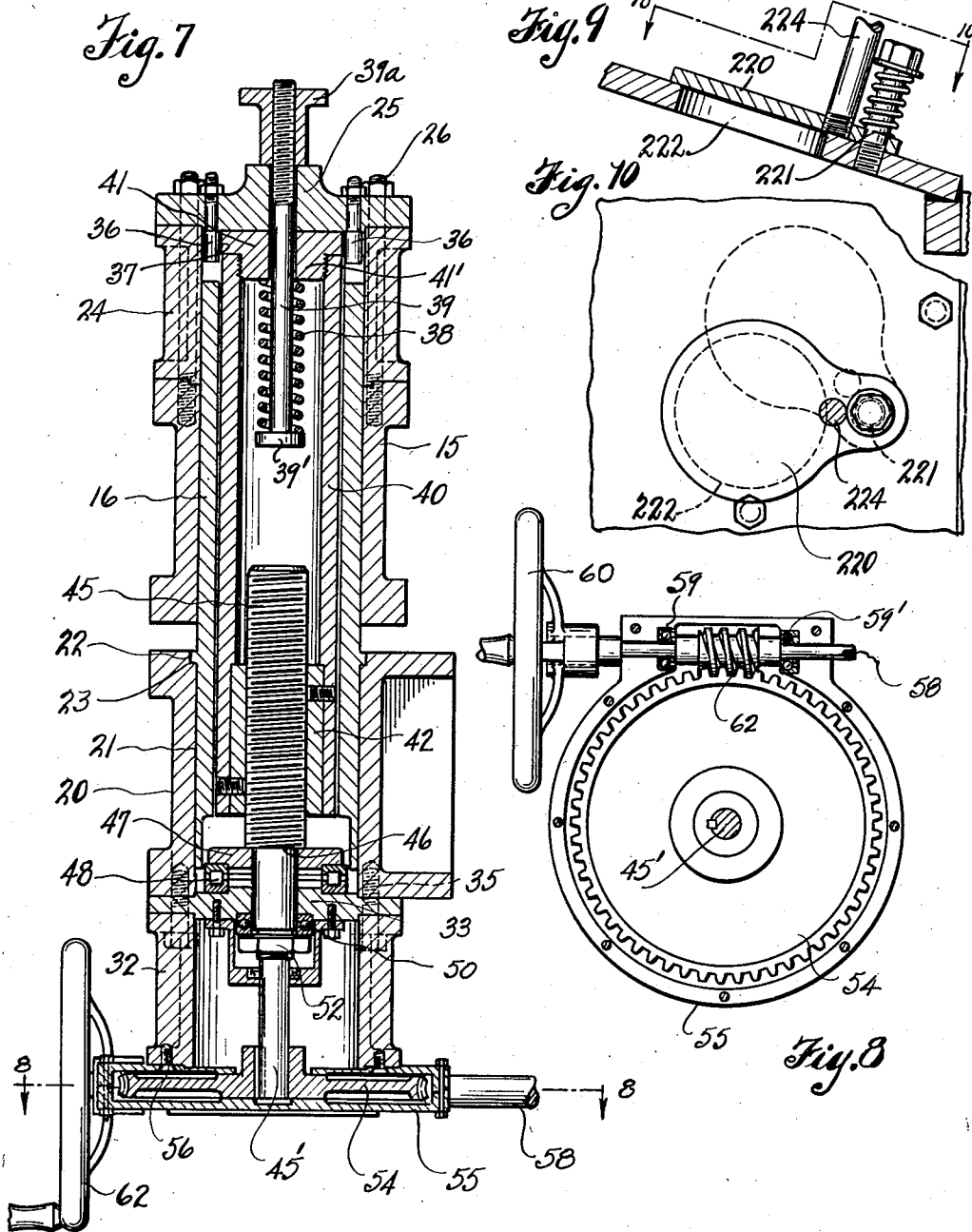
Oct. 10, 1944.

F. FLUCKINGER
GLUE SPREADING MACHINE

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7 Sheets-Sheet 6



INVENTOR
FRANK FLUCKINGER
BY
Cook & Robinson
ATTORNEY

Oct. 10, 1944.

F. FLUCKINGER

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GLUE SPREADING MACHINE

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7 Sheets-Sheet 7

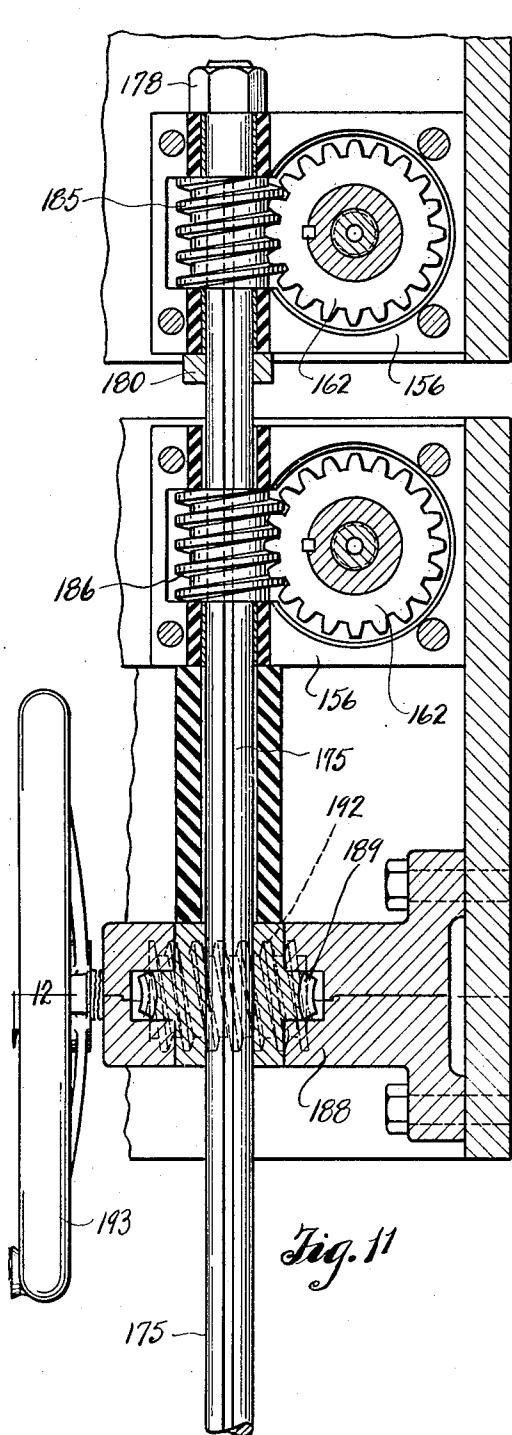


Fig. 11

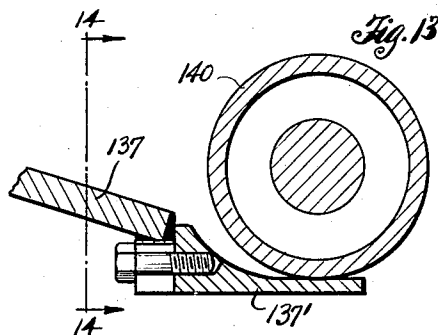


Fig. 13

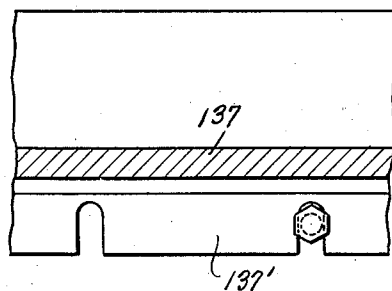


Fig. 14

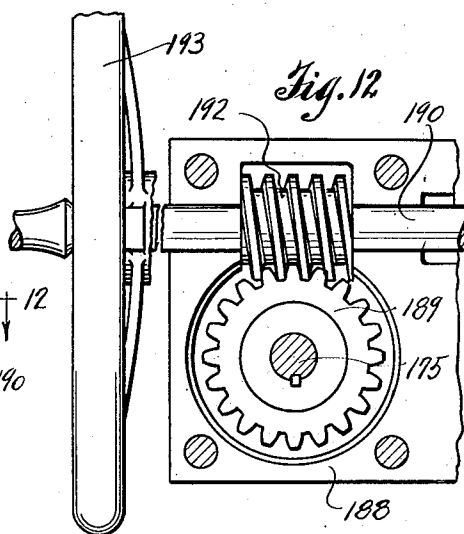


Fig. 12

INVENTOR
FRANK FLUCKINGER
BY
Cook & Robinson
ATTORNEY

UNITED STATES PATENT OFFICE

2,359,904

GLUE SPREADING MACHINE

Frank Fluckinger, Seattle, Wash.

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4 Claims. (Cl. 91—49)

This invention relates to glue spreading machines, and it has reference more particularly to improvements in machines for the application of glue to the opposite surfaces of the core sheets of plywood as used in the manufacture of plywood panels; it being understood that the core sheets for such panels, prior to being assembled with the adjoining or face plies, are given a coat of glue on each surface, then the face plies are assembled therewith and finally the assembled panel is put under pressure, which is retained during a drying period or until the glue has set.

More specifically stated, the present invention has to do with improvements in machines of the above kind wherein the glue is applied by rolls that rotate within glue containing troughs and are arranged for contact with upper and lower surfaces of the core sheets as they are passed through the machine, and wherein a doctor roll is associated with each of the glue applying rolls for the purpose of gauging the thickness of the glue film that is to be transferred from the roll to the engaged surface of the core ply in passing through the machine.

Explanatory to the present invention, it will here be stated that, to my knowledge, it is not new in the use of machines for the mechanical application of glue, to employ glue applying rolls in substantially the same relationship as I now employ them, and also, it has been the usual practise to determine the thickness of glue film to be applied to a surface by the adjustment of doctor rolls from and toward the surfaces of the glue applying rolls. However, there has been the undesirable requirement, whenever an adjustment was necessary, either in the spacing of the main rollers which apply the glue to the opposite faces of a ply or sheet of material, or in any adjustment of the doctor rolls relative to the glue applying rolls, that the rolls not only be individually adjusted, but also that adjustments of the opposite ends of each roll be individually made.

Means for and methods of making adjustments as heretofore done not only required considerable time, but also were unsatisfactory from the standpoint of the great difficulty in getting all adjustments accurately alike.

Therefore, in view of the objections and difficulties heretofore experienced in making the required, or desired adjustments of the rollers in glue applying machines, it has been the principal object of this invention to provide means for the quick and accurate adjustment of the main rollers in spacing for panels of any specified thickness, and whereby the required adjust-

ments may be made simultaneously at both ends of the rolls; also, to provide for making simultaneous and equal adjustments of both of the doctor rolls of a machine, simultaneously at both ends thereof.

It is also an object of the invention to provide for the making of adjustments from a control member that is common to the supports for both ends of a set of rolls.

Still another object of this invention is to provide novel adjustment means whereby the required adjustments may be made with accuracy and then retained without possibility of slippage.

Still further objects of the invention reside in improvements of construction which permit yielding of the glue rollers relative to each other as a means for protecting them against impact, shock or excessive wear.

Still further objects of the invention are to be found in the various details of construction of parts, in their combination, and in their mode of operation, as will hereinafter be fully described.

In accomplishing these and other objects of the invention, I have provided the improved details of construction, the preferred forms of which are illustrated in the accompanying drawings wherein—

Fig. 1 is an elevation showing the receiving side of a glue applying machine embodying the present invention.

Fig. 2 is a side elevation of the machine as seen from the delivery side.

Fig. 3 is an end elevation of the machine, particularly illustrating the means for driving the glue applying rolls, and the provision for making adjustments in spacing of the rolls without their disconnection from the driving chain belt.

Fig. 4 is a cross sectional view of the machine, as seen on the line 4—4 in Fig. 1.

Fig. 5 is an enlarged sectional detail, taken in a horizontal plane and on the line 5—5 in Fig. 3; the center portion of the machine being broken away to permit condensing of the view.

Fig. 6 is a similar horizontal section, taken on the line 6—6 in Fig. 3.

Fig. 7 is a sectional view longitudinally of one of the roll supporting posts, in the vertical plane of the line 7—7 in Fig. 6.

Fig. 8 is a horizontal section on the line 8—8 in Fig. 7.

Fig. 9 is a sectional detail of the structure of the drain valve for the upper glue trough.

Fig. 10 is a plan view of the same parts.

Fig. 11 is an enlarged, sectional detail on the line 11—11 in Fig. 6.

Fig. 12 is a horizontal section on the line 12—12 in Fig. 11.

Fig. 13 is an enlarged sectional detail of a part of the upper glue trough construction.

Fig. 14 is a section on the line 14—14 in Fig. 13.

Referring more in detail to the drawings—

As best observed by reference to Figs. 1, 2, 3 and 4, the present machine comprises a substantial and rigid main frame structure. This structure includes vertically and transversely disposed opposite end frames, 1 and 2, which are joined rigidly together by the longitudinally extending angle bars 3 and 4, at opposite sides of the frame structure; these bars being connected at their ends to the frames near upper and lower ends thereof. Each of the end frames includes also as parts thereof, a cross web plate 5 that joins the upper end portions of the frame legs just above the points of connection of the longitudinal beams 3 therewith, a top plate 6 that is disposed horizontally or flatly upon the upper ends of the frame leg portions, and a vertical plate 7 extending transversely of the main frame and registering along its lower edge with the inner longitudinal edge of the corresponding plate 6; all of these parts constituting the frame being welded or otherwise joined together to form a substantial and rigid structure.

Mounted upon the horizontal top plates 6 of the opposite end frames and attached by welding or otherwise to the vertical plates 7 are castings, later to be more specifically identified, that form supports for the glue applying and the doctor rolls, presently to be described.

The present machine is equipped with two longitudinally extending and truly cylindrical glue applying rolls 10 and 10', and these are disposed lengthwise of the machine with axes parallel and disposed in the same vertical plane as shown in Fig. 4. The lengths of the rolls would be such as to accommodate the passing of panels of substantial width between them, and preferably they are of substantial diameter in order to facilitate their use.

The rolls 10 and 10', with surfaces properly prepared for their intended use, are supported, respectively, by their axles 11 and 11', the opposite ends of which axles extend beyond the ends of the rolls and are revolvably mounted by suitable anti-friction bearings, designated by numeral 12, as noted in Fig. 5; the axle 11 of the lower roll thus being supported at its opposite ends respectively, through the mediacy of the bearings 12, in bearing blocks 13 and 13' which, in turn, are mounted upon and fixed to the cross plates 6 and 6' of the opposite end frames 1 and 2. In this instance, the lower roll has no provision for adjustment relative to the supporting frame. The upper roll 10', however, is similarly supported at its ends in bearings 12 which are contained in seats provided therefor in bearing blocks 14 and 14', to which supports 15 and 15' are fixed for travel on vertical guide posts 16 and 16' that are supported from and are fixed relative to the end frames, thus to provide for change in spacing of the glue rolls as required for the passage of panels of different thickness between them. The means for effecting the adjustment in spacing of the rollers 10 and 10' and for retaining an adjustment will now be described in detail.

First, it is to be observed by inspection of Fig. 5, that castings 20 and 20' are fixed to or formed

integral with the bearing blocks 13 and 13', in which blocks the opposite ends of the axle 11 of the lower glue roll 10 are mounted; these castings being fixed to the blocks, are therefore fixed relative to the main frame structure. Each casting, 20 and 20', as indicated in Fig. 7, has a vertical bore 21 in which the lower end portion of the corresponding guide post 16 or 16' is fitted for rigid support of the post, and the posts are formed with encircling shoulders 22 engaging with seats 23 in the top surfaces of the castings to limit their downward movement therein.

The castings 15 and 15' are bored to receive and fit slidably on the posts 16 and 16', and as shown in Fig. 7, each casting has a cylindrical extension member 24 fixed coaxially to its upper end, and extended somewhat beyond the upper end of the corresponding post 16 or 16'. Each extension 24 is closed at its top end by a cap or plate 25, and bolts 26 are extended down through the cap and walls of member 24, and are threaded into the upper end flange of the bearing 15 to join the parts solidly together.

Likewise, fixed to the lower ends of the two castings 20 and 20', are cylindrical extensions 32, with disks 33 interposed between the lower end surfaces of the castings and the cylindrical extensions, and the assembly united rigidly by bolts 35, as noted in Fig. 7.

Coaxially contained within each post 16 and 16', which are at the opposite ends of the machine, is a tubular sleeve 40, which, at its upper end, is threaded onto a central body 41' of a disk 41 which is disposed flatly against the under side of the disk 25 within the upper end of the extension 24.

Each disk 41 is held against rotation with the sleeve by studs 36 which are fixed in the disk 25 and extend down through holes 37 in the disk 41, and the disk 41 is yieldably held against disk 25 by pressure of a coiled spring 38 which is applied about a vertical bolt 39 that extends slidably through openings centrally of the disks and which, at its lower end, has a head 39' to support the spring and at its upper end has a nut 39a applied thereto to vary the tension of the spring as required.

At its lower end, the sleeve 40 has a nut 42 fitted and fixed therein. Threaded upwardly through the nut, and coaxially contained in the sleeve, is a screw shaft 45 which is shouldered, as at 46, by reduction of diameter of its lower end portion, to rest upon a horizontal disk 47 which, in turn, rests upon a thrust bearing 48 which is operatively supported on the disk 33. The lower, reduced end portion 45' of shaft 45 extends down through the disk 33, beyond the lower end of the cylindrical extension 32, and a thrust bearing 50 is applied thereabout against the flat under side of the disk 33, and a nut 52 is threaded onto the shaft end portion 45' to engage against the bearing. Thus, the screw shaft 45 is held against any longitudinal travel relative to the casting 20 and main frame, but it may be freely rotated.

Fixed on the lower end of each shaft extension 45' is a relative large worm gear wheel 54; these wheels being contained in housings 55 which are fixed by screws 56 to the lower ends of the parts 32 as noted in Fig. 7.

With the understanding that the posts 16 and 16' at opposite ends of the main frame are mounted, as illustrated in Fig. 7, and that each is equipped with the internally contained adjusting screw, and various parts associated there-

with as described, for the support and adjustment of the guide bearings 15 and 15', it can be seen that by rotation of the shafts 45, the sleeves 40 will be raised or lowered accordingly and thus the upper roller 10' will be adjusted from or toward the lower roll 10. Furthermore, with the shafts rotating in unison, the adjustment of the roll at both ends will be equal.

To accomplish this equal adjustment, by rotation of the shafts 45 in unison, I have provided an adjusting shaft 58 which is common to the worm gears 54 of both shafts. This shaft 58, as noted in Fig. 6, extends longitudinally of and from end to end of the main frame, and passes rotatably through bearing portions 59 and 59' of housings 55 which enclose the worm gear wheels 54.

Fixed on the shaft 58 within the housings, and meshing with the worm gear wheels 54, are worms 60-60', as observed in Fig. 8, and on the end of the shaft is a hand wheel 62 whereby the shaft may be manually rotated, thus, through the gearing described, to effect any desired adjustment in spacing of the upper roller, relative to the lower roller. The worms 60-60' in this instance, form automatic locks for the worm gears 54, and thus positively hold the top roller at any set position of adjustment.

In connection with the provision of means for rotatably driving the two glue applying rolls 10 and 10' for the glue spreading operation, it will be explained that each is equipped at one end with an extension axle, aligned with its supporting axle, and these extension axles project beyond one end of the machine where they are suitably equipped with driving sprockets. By reference more particularly to Fig. 5, it will be observed that there is such an extension axle 11x for the lower roll, rotatably supported in spaced bearings 69 in the casting 20', and at its inner end, it is operatively connected to the axle 11 by means of a chain coupling of the conventional type as designated at 70. At its outer end, the extension axle 11x is equipped with a driving sprocket wheel 71.

By referring to Fig. 6, it will be understood that the axle 11' of the lower roll is similarly equipped with an extension axle 11y, revolubly supported in bearings in the casting 15', and at its inner end has a chain coupling 70' with the axle 11' and at its outer end is equipped with a driving sprocket wheel 72.

For driving the glue rolls, the machine is equipped with an electric motor, designated in Figs. 1 and 2 by reference numeral 75. This motor has a driving connection, through a suitable reduction gear mechanism, indicated at 76, with a drive shaft 78 on which a sprocket wheel 77 is mounted. It will be understood best by reference to Figs. 1 and 3, that a sprocket chain belt 79 operates about the driven sprocket wheel 78 and about an idler sprocket 80 revoluble on an axis 81 supported by a housing 82; the sprocket 80 being located somewhat above the level of the top roll 10', and the housing being rigid and solidly fixed to the casting 20' and serves additionally as means for enclosing the sprockets and chain belt. The chain belt has one run thereof passed across opposite sides of the sprocket wheels 71 and 72 which are keyed on the outer ends of the extension axles 11x and 11y.

It is the intention that in use of the present machine, the core sheets to be glued, be passed into the machine from the left-hand side as shown in Fig. 4, and that the spacing of rolls be as re-

quired to grip both surfaces of the sheet; the sheet being designated by numeral 125. The direction of driving of the rolls would therefore be as indicated by the arrows thereon, and this is accomplished by applying the chain belt to the sprocket wheels in the manner shown.

It will also be understood by reference to Fig. 3, that any vertical adjustment in spacing of the rolls can be accomplished without causing any loosening or tightening of the driving chain and without stopping or disrupting the driving connection.

Each of the rolls 10 and 10' operates in a glue containing trough to pick up the glue and transfer it to the opposite faces of the sheets or panels 125 as passed through the machine, and each glue applying roll has a doctor roll associated therewith for the determination of the thickness of the glue film to be applied thereby.

The lower roll 10 extends longitudinally within a glue trough that is formed by a horizontal bottom wall portion 130 and outward inclined opposite side wall portions 131 and 132; these trough forming parts being extended from end to end of the frame and are welded to the vertical plates 7-7' of the opposite end frames.

Parallel with the lower glue applying roll 10 is a doctor roll 135, which, as noted in Fig. 4, is located above the normal indicated level of glue in the trough.

The upper roll 10' in effect forms one side wall of an upper glue trough which comprises also the side wall portion 136 opposite the roll 10', and a bottom wall plate 137. Associated with the roll 10', as shown in Fig. 4, is a doctor roll 140, and this operates in close relationship to a bottom wall plate 137', as is best noted in Fig. 13.

The lower doctor roll 135 is equipped at its ends with extended supporting trunnions or axle extensions 141 and 141', as will be understood by reference to Fig. 6, and these trunnions are contained revolubly in adjustable bearings 142 and 142'. Fixed on the end of the axle extension 141 is a driving gear 143. This operates in mesh with a worm 144 on a driven shaft 145 that is revolubly mounted in bearings 146 in the casting 20 at a right angle to the axle 11, and is operatively connected thereto by a bevel gear 148 fixed on the shaft and meshing with a bevel gear 149 fixed on the axle.

The upper doctor roll 140 likewise is supported at its opposite ends in the castings 14 and 14' by means of axle extensions at its ends; these extensions being mounted in adjustably supported bearings like the bearing 142, which carry the supporting trunnions of the doctor roll 140. Also, the end of the supporting axle or trunnion of the upper doctor roll, corresponding to that equipped for driving the lower roll, is equipped with gear sets which drive the doctor roll from the axle of the driven upper glue roll in the same manner and by the same character of means as described in connection with the driving of the lower doctor roll. In view of the fact that both doctor rolls are driven by identical means, and in the same manner, from the axles of their respective glue rolls 10 and 10', only the driving means for the lower doctor roll has herein been illustrated in detail.

The means for adjusting the spacing of each doctor roll from its corresponding glue roll to determine the thickness of the glue film or coat

to be applied thereby, will be best understood by reference to Figs. 6 and 11. As was previously stated, the supporting trunnions 141 and 141' for the doctor roll 140 are revoluble in bearings 142 and 142', as shown in Fig. 6. Each of these bearings is formed with a lateral, tubular extension 142x, and these extensions are slidably fitted within horizontal and inwardly opening bores 155 of gear housings 156 that are bolted or otherwise fixed to the outside faces of the plates 7 and 7' of the end frames 1 and 2. A shaft 158 of reduced diameter continues outwardly from the end of each of the extensions 142x through an opening at the base of the corresponding bore 155, and into an enlarged bore 159 opening to the outside face of the housing 156. Contained in the bores 159 and threaded onto the end portions of said extension shafts 158, are nuts 160. Keyed onto each of the nuts is a worm gear 162, and in Fig. 6 it is shown that these worm gears are fitted between the opposite side walls of recesses 163 in the housings 156. It is also shown that the inner ends of the nuts engage with bearings 164 which seat against the base of the bores 159 containing the nuts. Also, it is shown that coiled springs 165 are placed about the extension shafts 158 to engage against the bases of the bores 155 and to bear outwardly against the bearing portions 142x.

Thus it will be understood that the position of each bearing 142 will be determined by the position of the corresponding nut 160 on the shaft 158 and that by turning the nut in one direction or the other, the bearing may be moved inwardly or outwardly. Furthermore, it will be understood that this rotatable adjustment of the nut 160 can be effected by rotation of the worm gear 162 that is keyed thereon.

In order that the opposite end portions of each doctor roll may be simultaneously adjusted to equal amounts with respect to its glue applying roll and also in order that both doctor rolls may be simultaneously adjusted to equal amounts, I provide a common means for effecting all of these adjustments, which I will now describe.

By reference to Figs. 6 and 11, it will be understood that vertical shafts 175 and 176 are mounted at opposite ends of the machine, each to extend through the gear housings 156 for the gear sets of the upper and lower doctor rolls. Each shaft extends revolubly through the housings, but is fixed in the upper housing, as seen in Fig. 11, by a nut 178 at the upper end of the shaft and a collar 180, which engage respectively with top and bottom walls of the housing. On each shaft, worm gears 185 and 186 are mounted for meshing respectively with the worm gear wheels 162 of the upper and lower sets of adjusting mechanisms; the gears 186 being slidably keyed on the shafts. These vertical shafts, at their lower ends, pass through housings 188 that are fixed to the end frames, and have worm gears 189 keyed thereon and contained in these fixed housings.

Extending longitudinally of the machine is a horizontal shaft 190, which passes revolubly through bearings in the housings 188, as indicated in Figs. 5 and 12, and on this shaft, worm gears 192—192' are fixed to mesh with the gears 189—189. At one end, the shaft 190 is equipped with a hand wheel 193.

With this arrangement of parts, it will be understood that by rotation of the shaft 190, both vertical shafts 175 and 176 will be simultaneously rotated in unison. It will further be understood that rotation of the vertical shafts, through their respective gearing connection with the gears 162 will cause simultaneous rotation of the nuts 160 on their respective shafts 158, thereby to effect inward or outward adjustment of the doctor rolls simultaneously and to equal extent in the same direction dependent upon the direction of rotation of the hand wheel 193.

It is to be understood more particularly by reference to Fig. 7, that there is a connection between the supports for the opposite ends of the upper roll and the adjusting screws. This provision is made as a safety factor, and makes possible the upward yielding of the upper roller in the event that any foreign object, lump or the like should accidentally be passed between the glue rollers with one of the panels. The springs also provide for maintaining a desired tension which will effect the proper feeding of the panels between the rolls.

As the plywood panels are delivered from the machine after passing between the glue applying rolls 10 and 10', they are passed over a stripper roll 200 which is supported at the outgoing side of the machine, parallel with the lower roll and substantially level with its top edge. The stripper roll is supported at its end by trunnions 201—201', which are revolubly contained, respectively, in bearings 203 and 204. As noted in Fig. 6, this stripper roll has an extension axle 205 equipped with a worm gear 206. The worm gear is in mesh with a driving worm 207 on a shaft 208 which extends laterally from the casting 20, and which, at its inner end, has a geared connection at 210 with the gear 141 at the end of the supporting axle for the lower glue applying roll.

The stripper roll is equipped at spaced intervals along its length with spaced circular disks 212, somewhat larger in diameter than the roll, and, as noted in Fig. 4, a wiper plate 215 is fixed to the adjacent side wall of the lower trough to engage with the stripper roll to clear it of excess glue that it might pick up.

As a matter of convenience, the glue is applied first to the upper trough and then a valve in the base of the upper trough is opened to permit glue to flow into the lower trough. This valve is shown in Figs. 9 and 10, wherein 220 designates a valve plate held by a pivot bolt 221 over an opening 222 in the base wall of the upper trough. A rod 224 extends upwardly from the valve disk, which rod is equipped at its upper end with a handle portion 226 whereby the valve may be moved rotatably about the pivot bolt to uncover the hole for an outflow of glue to the lower trough.

The detail shown in Figs. 13 and 14 shows that the upper doctor roll operates at its lower edge in close contact with a bottom wall plate of the trough. The parts are sufficiently close together as to prevent leakage of glue. However, there is no fixed connection, and the doctor roll may be adjusted inwardly or outwardly while maintaining its close contact with the bottom plate.

Having thus described my invention, what I claim as new therein and desire to secure by Letters Patent is:

1. In a glue spreading machine of the character described, a frame structure, a pair of glue applying rolls disposed in parallel relation, one

above the other, means for supplying glue to the rolls, bearing blocks fixed on the frame for the rotatable support of the lower roll, guide posts fixed on the frame at opposite ends of the rolls, bearings for the rotatable support of the opposite ends of the upper roll, sleeves fixed to said bearings and slidably mounted on said posts, an adjusting screw for moving each sleeve along its post, and a manually operable means common to both the adjusting screws, operable to effect a simultaneous and equal positive adjustment of the sleeves along the posts for a determination of the spacing of the rolls and yieldable means in each adjusting connection permitting yielding in the spacing of the rolls.

2. In a glue spreading machine of the character described, a frame structure, a pair of glue applying rolls disposed in parallel relation, one above the other for the passing of panels between them for application of glue to opposite surfaces of the panels, means for supplying glue to the rolls, bearings fixed on the frame for rotatable support of the lower roll, at its opposite ends, tubular guide posts fixed on the frame, beyond the opposite ends of the rolls, bearings rotatably mounting opposite ends of the upper roll therein, a guide sleeve fixed to each of the said bearings, and slidably mounted for movement along the corresponding post, an adjusting screw shaft revolvably fixed in each post, a sleeve threaded onto each screw and extended upwardly beyond the upper end of the post, means fixedly connecting each of the said sleeves, at its upper end, with the corresponding guide sleeves, and an adjusting shaft for rotation of said screws to effect simultaneous and equal adjustments of the guide bearings to determine the spacing of the glue rolls.

3. In a glue spreading machine of the charac-

ter described, a frame structure, a pair of glue applying rolls disposed in parallel relation, one above the other for the passing of panels between them for application of glue to opposite surfaces of the panels, means for supplying glue to the rolls, bearings fixed on the frame for rotatable support of the lower roll, at its opposite ends, tubular guide posts fixed on the frame, beyond the opposite ends of the rolls, bearings rotatably mounting opposite ends of the upper roll therein, a guide sleeve fixed to each of the said bearings and slidably mounted for movement along the corresponding post, an adjusting screw shaft revolvably fixed in each post, a sleeve threaded onto each screw and extended upwardly beyond the upper end of the post, means fixedly connecting each of the said sleeves, at its upper end, with the corresponding guide sleeves, a gear wheel fixed on the lower end portion of each screw shaft, an adjusting shaft revolvably mounted and extending lengthwise of the machine, gears fixed on said shaft in mesh with the gear wheels first mentioned and means for turning the shaft to effect the simultaneous and equal adjustment of both guide sleeves.

4. In a glue spreading machine of the character described, a pair of glue rolls relatively movable mountings therefor, means for supplying glue to the rolls, means for changing the spacing of the rolls by change in spacing of their mountings, a doctor roll associated with each glue applying roll, individual supports for the doctor rolls at their opposite ends movable with the rolls, and means common to all supports for effecting their simultaneous and equal adjustment to move the doctor rolls from and toward the glue rolls.

FRANK FLUCKINGER.