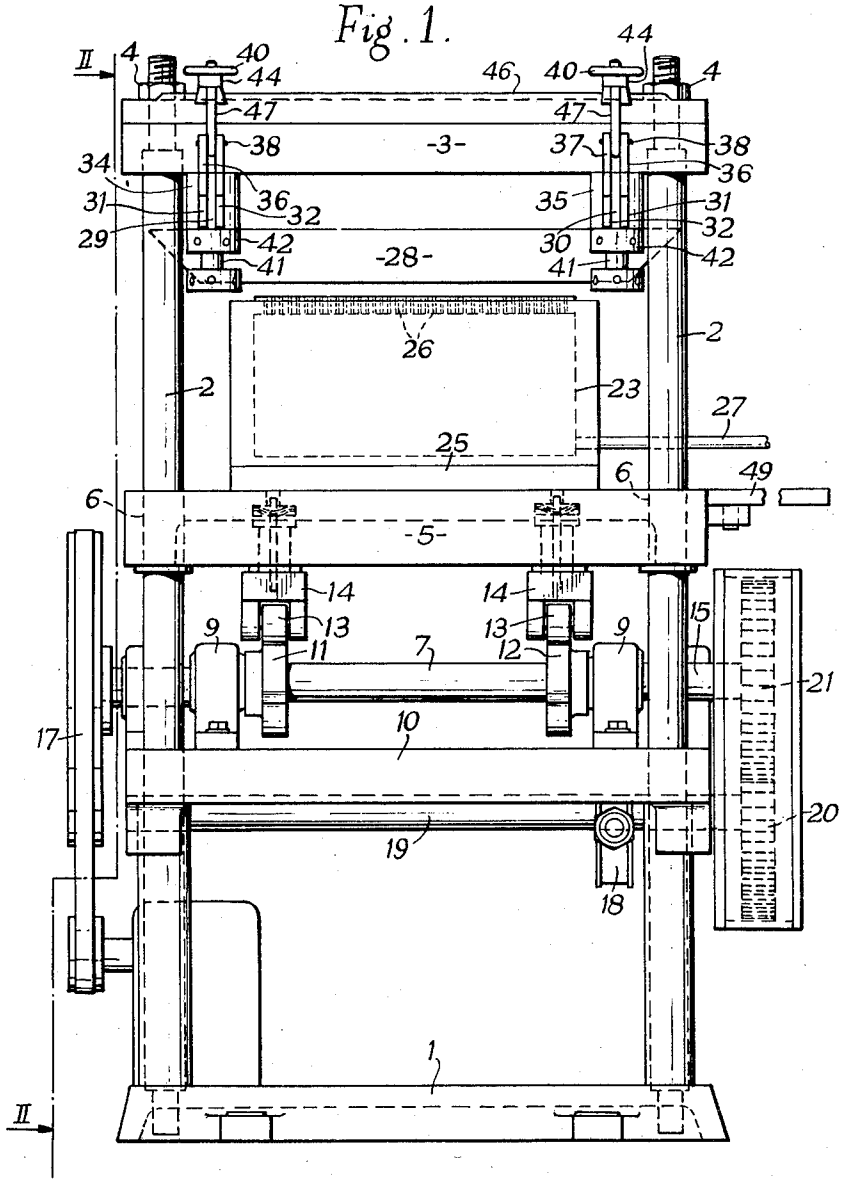
Jan. 30, 1962 J. G. NASH 3,018,724

APPARATUS FOR THE DEPOSITION OF VISCOUS LIQUID MATERIALS

Filed Feb. 9, 1959 3 Sheets-Sheet 1

Fig. 1.



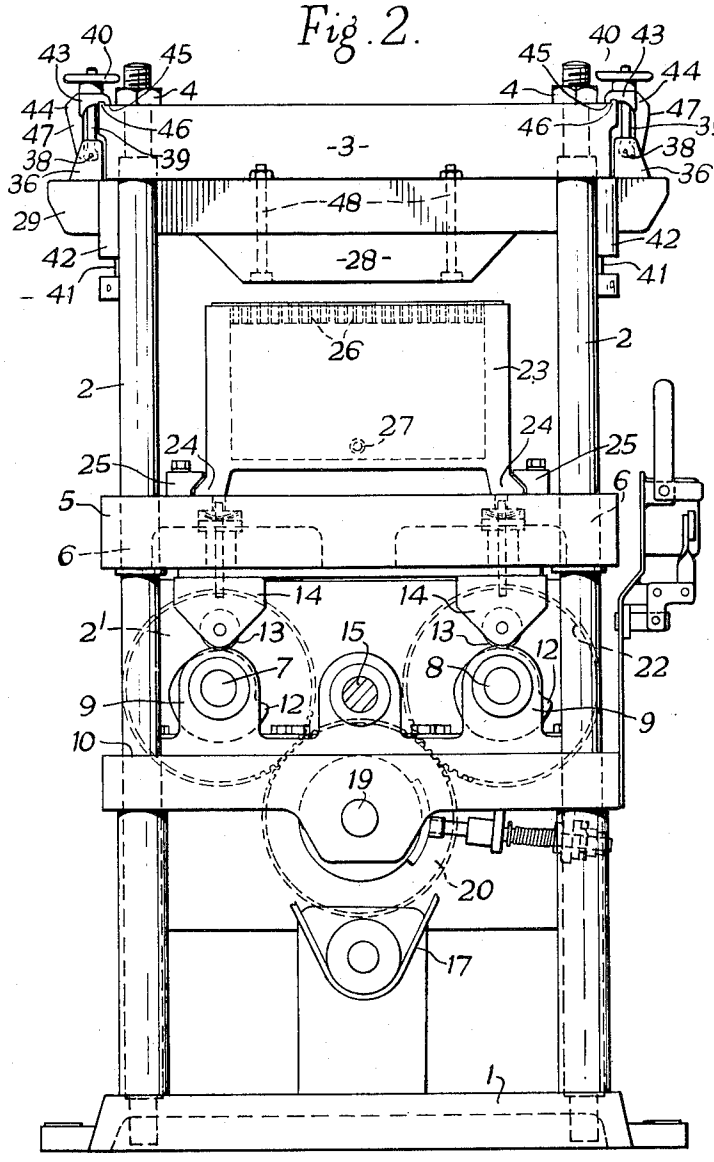
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Fig. 2.



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Fig. 3.

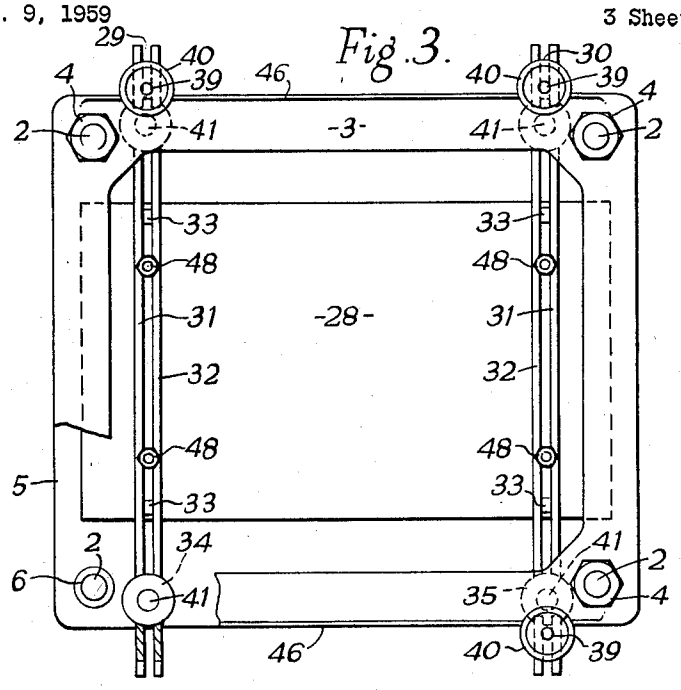


Fig. 4.

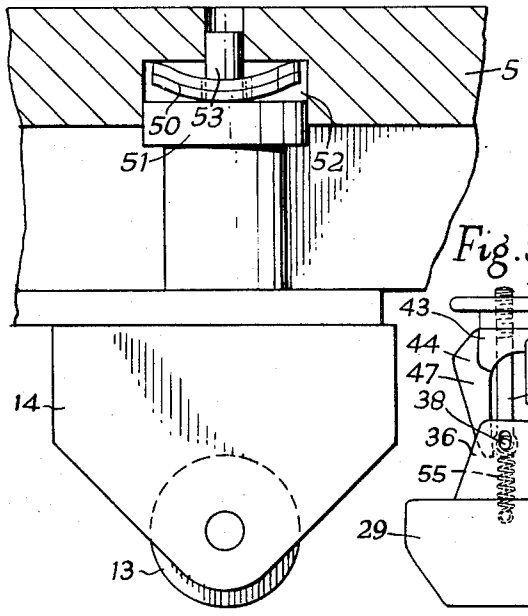


Fig. 5.

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APPARATUS FOR THE DEPOSITION OF VISCOUS LIQUID MATERIALS

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Claims priority, application Great Britain Feb. 13, 1958
6 Claims. (Cl. 101—171)

The present invention is concerned with improvements in and relating to apparatus for the deposition of thin layers of paints, inks and other viscous liquid materials in accurately defined areas on surfaces, the apparatus being of the kind comprising a matrix having a number of shallow cavities formed in its operative face for the reception of the material to be deposited on the said surface in patches or areas defined by the boundaries of the cavities in the matrix, which cavities are closed by the application of the surface intended to receive the deposited material against the said operative face of the matrix, conduits leading through the matrix to the cavities for the pressure-introduction thereto of the material to be deposited, and means being provided for controlling relative movement between the matrix and the surface intended to receive the deposit.

The materials to be deposited by utilization of such apparatus are liquids which remain in the accurately defined areas in which they have been deposited when the matrix and the surface are separated. For example, such apparatus has been used for the deposition of paint on sheets of paper or paper board to form what are konwn as "colour cards."

Each apparatus usually comprises a fixed frame structure including a number e.g. four vertical posts carrying a rigid horizontal head frame, the matrix being fixedly mounted in the frame structure in a horizontal position with the cavities therein facing downwards, and a platen arranged for rising and falling movements parallel to itself and to the matrix in the frame structure to raise and lower the sheets or other articles towards and away from the fixed matrix.

It is usual to employ a rising and falling platen of substantially constant stroke on which is carried a flat- so-called "make ready" support on which the sheets of paper, card or the like are received singly in succession, the sheets being held thereon for example by suction through small distributed holes in the make-ready support, and the held sheet in the raised position of the platen being held in pressure engagement with the underface of the matrix.

It is essential that effective and substantially uniformly distributed pressure engagement be made between the surfaces of the matrix and the sheet in order to avoid leakage of the liquid past the boundaries of the recesses in the matrix during deposition while also avoiding marked indentation and disfigurement of the surfaces receiving the deposit and since deposits are required to be made on sheets or the like of different thickness tedious and time-consuming preparation steps are involved in setting-up for a new job, such as substitution of matrices and substitution and packing of make-ready supports to ensure accurately adequate and uniform surface-pressure engagement between the sheets and the matrices.

It is the object of the present invention to provide an improved apparatus of the kind referred to above with which the setting-up operations can be carried out more easily and quickly than with the hitherto known apparatus.

The invention consists in an apparatus of the kind referred to comprising a rigid frame structure including a number of vertical posts carrying a rigid head frame and a rising and falling platen having a substantially constant

stroke for raising a sheet of material into engagement with a matrix, wherein matrix supporting and adjusting means is provided in the form of one or a number of supporting members movable with regard to the fixed head frame, adjustable connecting members between the matrix support or supports and the head frame permitting adjustment of the position of the support or supports and therefore of a matrix carried thereby relative to the head frame, and separately adjustable elements carried by the matrix support or supports or the head frame and constituting spacing abutment members for maintaining spacing between the matrix support or supports and the head frame as set.

Commercially available card and paper sheets often show slight variation in thickness between different parts of the area thereof and in order to be able to apply such sheets of varying thickness with substantially uniformly distributed pressure against the matrix the rising and falling platen of the improved apparatus is arranged to be capable of very small rocking movements from true parallelism with the face of the matrix and the lifting force is applied to the platen at a number of distributed points and through means at those points of application capable of a very limited yield.

The invention is illustrated by way of example in the accompanying drawings in which:

FIG. 1 is a view in front elevation of a complete machine.

FIG. 2 is a view in part sectional side elevation.

FIG. 3 is a view in plan of the head frame and the matrix supports and

FIGS. 4 and 5 are enlarged views of details.

Referring to the drawings, the machine comprises a rectangular base plate 1 and four fixed parallel vertical posts 2 extending upwards from the corners of the base plate 1 and fixedly connected at their upper ends to a rigid head frame 3.

The head frame 3 may be a hollow frame as shown in FIG. 3 connected with the upper ends of the posts 2 by nuts 4 applied over reduced and screw-threaded parts at the upper ends of the posts.

The rising and falling platen has the form of a stiff plate 5, usually a casting, apertured at its four corners to provide guide holes 6 for sliding engagement over the posts 2.

A pair of parallel cam shafts 7 and 8, mounted in fixed bearings 9 on a platform 10 fixed to the posts 2 in a position below the platen 5, each carry two similar cams 11 and 12 engaging cam rollers 13 mounted in yokes 14 carried at the underside of the platen 5, one near each corner thereof.

A drive shaft 15 is mounted in fixed bearings 16 on the platform 10 and between the cam shafts 7 and 8 and is driven continuously by a belt, chain or the like 17 from a motor and the drive shaft 15 is in driving connection through gearing and a one-revolution clutch 18 of any convenient form with a countershaft 19 so that the latter may be caused to make single complete revolutions at the will of an operator, and a gear wheel 20 on the countershaft 19 makes meshing engagement with similar gear wheels 21 and 22 on the crankshafts 7 and 8 so that the cam shafts make single revolutions with the countershaft thus effecting a timed up and down movement of the platen 5.

On the platen 5 in the case illustrated, is mounted a rigid "make-ready" block 23 in the form of an inverted hollow box of metal having a flat top, the block having dovetail flanges 24 on two sides for sliding engagement with parallel dovetail strips 25 fixed on the platen 5.

The lower end of the hollow make-ready block 23 is closed and the upper wall thereof is furnished with a number of distributed apertures 26 and the interior of

the block is connected through a flexible pipe 27 (FIG. 1) with a suction line so that a sheet of paper or card placed on the flat upper surface, if necessary with the interposition of packing pieces etc. in readiness to be applied to the matrix to receive the deposit, is retained firmly in position down on the apetrured upper surface of the block 23 by suction.

The matrix is a metal block 28 of known kind having shallow cavities in one of its major faces and passages through the body of the block connected with pipes (not shown) whereby liquids to be deposited can be introduced under pressure from a suitable source and through said pipes and passages into the cavities whilst the cavities are closed by the application of a sheet of card or the like with pressure against the face of the matrix containing the cavities.

In a machine as illustrated the matrix 28 is mounted in the upper part of the machine with the face containing the cavities facing downwards, so that when the platen 5 and the make-ready block 23 with a sheet of card in position on the upper surface thereof are raised by the cams 11 and 12 the sheet of card can be brought into pressure engagement with the under face of the matrix to close the cavities, after which the liquids to be deposited are delivered under pressure in known manner through the passages through the matrix, to fill the cavities and thereby deposit the liquid in areas on the card defined by the boundaries of the cavities in the matrix 28.

The matrix 28 is mounted in the machine by means enabling its position relative to the sheet of card or the like when raised to be set so that the engagement between the sheet and the matrix takes place with substantially uniformly distributed pressure.

The matrix suporting means consists of two stiff bars 29, 30, extending parallel to one another from back to front across the machine immediately below the head frame 3.

Each bar 29 and 30 is formed of two metal strips 31 and 32 (FIG. 3) welded together but in spaced relationship through spacing pieces 33 at intervals along their length.

The bars 29, 30 embody sleeves 34 and 35 near to but slightly spaced from their extremities and with their axes parallel to and midway between the planes of the two strips forming the bar, the sleeves being internally threaded, and on the ends of the strips forming the bars are formed upstanding lugs in pairs 36, 37 having holes therein forming bearings for pivoting cross pins 38 at the lower ends of screws 39 provided on their upper ends with hand wheels 40.

The sleeves 34, 35 contain bolts 41 introduced from the ends of the sleeves remote from the upstanding lugs 36, 37 and lock nuts 42 are provided on the bolts 41 prior to insertion in the sleeves.

The screws 39 extend freely through holes in one of the arms 43 of support members 44 of bell crank form, the arms 43 terminating in hooks 45 for retaining engagement over beads 46 formed on two opposite edges of the upper surface of the head frame 3.

With the hooks 45 engaged over the beads 46 the other limbs 47 of the bell-crank support members 44 extend downwards and contact the outer sides of the cross pins 38, and the free ends of the bolts 41 in the sleeves 34, 35 of the support bars 29, 30, are in register with parts of the surface of the underside of the head frame 3.

The matrix 28 is rigidly fixed to the two support bars 29, 30 by means of bolts 48 passing through the matrix and upwards through the slots between the two strips 31 and 32 constituting the bars.

The make-ready work on the upper face of the make-ready block 23 having been completed and the matrix 28 to be used having been rigidly bolted to the two support bars, a sheet of card or paper is placed on the upper surface of the block 23.

The lock nuts 42 and bolts 41 on the support bars 29 and 30 are slackened off and the platen 6 then moved to its fully raised position by mean of the cams 11 and 12, usually through a hand gear (not shown) operating on the drive shaft, the suction through pipe 27 being meanwhile on to hold the sheet down on the surface of the block 23.

With the platen 23 and the parts carried thereby held in the fully raised position the support bars 29, 30 may now be lowered by means of the several hand wheels 40 and screws 39 until the lower cavity-containing surface of the matrix 28 makes uniformly distributed surface engagement with the sheet on the make-ready block.

With the matrix 28 in this position, the bolts 41 in the sleeves 34, 35 are turned e.g. by means of a tommy bar engaging in holes in the heads of the bolts 41, to engage their uper free ends with the underside of the head frame 3, the lock nuts 24 then being moved into the locking position.

When necessary or desirable additional pressure over and above that corresponding to the weight of the matrix and the support bars may be applied to the sheet on the block by manipulation of the abutment bolts 41 in conjunction with the suspension screws 39.

With the matrix 28 set as described, a succession of similar sheets or cards may be engaged by the rising of the platen 5 with the matrix to receive the deposits from the filled cavities in the matrix, it being understood that the matrix operates at a speed permitting removal of a sheet having a deposit and insertion of a new sheet whilst the platen is down and the supply of liquid to the matrix being arranged to take place under any convenient and known form of control only whilst the platen is in its fully raised position.

The use of the bell crank support members 44 offers the advantage of very rapid disconnection and removal of support bars 29 and 30 with one matrix and substitution of other support bars and another matrix.

In lighter built machines however the bell crank support members may be dispensed with, the screws 39 extending through holes in the head frame 3 and the cross pins 38 may be knock-out pins permitting separation of the support bars 29, 30 from the screws 39.

With heavier built machines using the bell-crank support members 44, strong tension springs 55 may be provided between the cross pins 38 and the support bars 29, 30, as shown in FIG. 5, the cross pins being capable of limited vertical movement in slots in the lugs 36, 37 but normally resting in the lower ends of the slots by virtue of the pull of the springs. Such an arrangement ensures absence of jamming and ease and freedom of movement of the hand wheels 40 after the support bars may have been drawn into firm contact with the head frame, the springs 55 in such case being loaded.

It will be understood that the sheets intended to receive the deposit may in some cases be carried directly upon the platen 5 itself, again being held thereon by suction.

The use of cams to raise and lower the platen however, in practise requires an up and down movement of the platen of relatively limited extent.

The use of the hollow make-ready block 23 offers the advantage that with the platen down the block 23 may be slid off from the platen 5 making use of the dovetail guides 24 and 25 and on to a removable table such as is shown at 49 in FIG. 1 where the upper surface of the block 23 is more readily accessible for make-ready purposes such as packing, patching, etc., and furthermore more ready access to the cavities in the under face of the matrix is also afforded.

To ensure substantially uniform pressure engagement between a sheet and the face of the matrix in the case of slight deviations of thickness in individual sheets, strong springs capable of only small yield under the degree of pressure involved with such machines, are employed between the cams 11, 12 and their several points of application at the underside of the platen 5.

As a particularly suitable form of spring may be mentioned steel washers having the form of centrally apertured dished discs as shown at 50 in FIG. 4 and commonly known as "Belleville" dished disc washers.

Such dished washers are highly resistant to heavy pressure, they occupy small compass and they lend themselves to ready matching up in sets.

As shown in FIG. 4 the washers 50 are inserted between the upper ends of the stems 51 of the yokes 14 supporting the cam follower rollers, and the bottom of recesses 52 formed in the underside of the platen 5 and they may be centralised or located by pins 53 extending from the stems 51 of the yokes 14 through the central holes in the dished washers and into holes 54 at the bottom of the recesses 52 in the platen 5.

Hardened steel thrust plates (not shown) may in some cases be provided on the bottom of the recesses 52 in the platen and in some cases on the stems 51 of the yokes, for engagement by the dished washers 50.

Any changes in the raised and lowered position of the platen 5 due to insertion or removal of washers 50 can of course be readily compensated for by adjustment of the vertical height of the matrix 28 in the manner previously described.

The means employed for causing introduction of the liquid material to be deposited through the matrix may be of well known form providing for initiating and stopping the supply of liquid to and from the cavities in timed relation with the cycle of movement of the platen.

I claim:

1. Apparatus for the deposition of thin layers of paints, inks and other viscous liquid material in accurately defined areas on the surface of a work piece, said apparatus comprising a rigid frame structure including a rigid head frame, a vertically reciprocable platen making up and down movements of substantially constant amplitude within said frame structure and below said head frame, a cavitated matrix engageable by the surface of a work piece carried on said platen in the raised position of said platen, a plurality of matrix-supporting bars extending across and beneath said head frame, a plurality of spaced bell-cranks each having one limb supported on the head frame, a member extending vertically through each of the limbs, means mounting one end of each of the members at one end of a respective matrix-supporting bar, means cooperating with the vertically extending members and the limbs for adjusting the vertical position of the matrix-supporting bars and the matrix-supported thereby in relation to the platen, and abutment screws in threaded engagement with said matrix-supporting bars and abutting the underside of said head frame for maintaining the adjusted position of the matrix-supporting bars and the matrix supported thereby.

2. Apparatus as claimed in claim 1 wherein the other limb of the bell crank depends generally vertically and outside the head frame and engages a part of the matrix-supporting bar.

3. Apparatus as claimed in claim 1 wherein the mounting means for the vertically extending members at each end of said matrix-supporting bars comprises a lost motion connection and a tension spring between each member and its associated matrix-supporting bar, said spring being loaded by movement of the said member in one direction upon contact of the abutment screws with said head frame.

4. Apparatus for the deposition of thin layers of paints, inks and other viscous liquid material in accurately defined areas on the surface of a work piece, said apparatus comprising a rigid frame structure including a rigid head frame, a vertically reciprocable platen making up and down movements of substantially constant amplitude within said frame structure and below said head frame, a cavitated matrix which is engageable by the upper surface of a work piece when the work piece is carried on said platen with the platen in the raised position, at least one matrix-supporting member extending across and beneath said head frame, means for affixing said matrix to said member beneath said member, a plurality of independent adjustment units carried by said head frame connecting said member to said head frame, said units being spaced apart from one another and positioned on said head frame so as to be adjacent the ends of the matrix-supporting member and a plurality of independent adjustable abutment elements for maintaining said supporting member and the matrix carried thereby in a fixed, predetermined position relative to said platen, said elements being spaced apart from one another and positioned adjacent the ends of said matrix-supporting member, said adjustment units and said abutment elements being independently vertically adjustable whereby said matrix-supporting member and the matrix carried thereby may be tilted with respect to the horizontal as well as moved vertically up and down.

5. Apparatus as claimed in claim 4 having means for effecting vertical movement of the reciprocable platen comprising a plurality of cams engaging the underside of the platen and distributed about the centre of said platen and a compression spring of high stiffness is provided between each cam and the point of application of pressure by the cam to the underside of the platen.

6. Apparatus for the deposition of thin layers of paints, inks and other viscous liquid material in accurately defined areas on the surface of a work piece, said apparatus comprising a rigid frame structure including a rigid head frame, a vertically reciprocable platen making up and down movements of substantially constant amplitude within said frame structure and below said head frame, a cavitated matrix which is engageable by the upper surface of a work piece when the work piece is carried on said platen with the platen in the raised position, a plurality of support bars extending across and beneath said head frame, means for affixing said matrix to said bars beneath the bars, an adjustment unit at each end of each of said bars, said units being carried by said head frame and being the sole means supporting the bars upon the head frame, and an adjustable abutment screw threaded in each end of each said bar, said screws being independently vertically adjustable to abut the underside of said head frame to maintain said bars in the position to which adjusted by said adjustment units, said adjustment units being independently vertically adjustable whereby said matrix-supporting member and the matrix carried thereby may be tilted with respect to the horizontal as well as moved vertically up and down.

References Cited in the file of this patent

UNITED STATES PATENTS

885,709	Althouse	Apr. 28, 1908
1,699,929	Szabo	Jan. 22, 1929
1,725,461	Lewis	Aug. 20, 1929
1,801,899	Bischoff	Apr. 21, 1931
1,849,597	Simms	Mar. 15, 1932
2,226,163	Dufour	Dec. 24, 1940