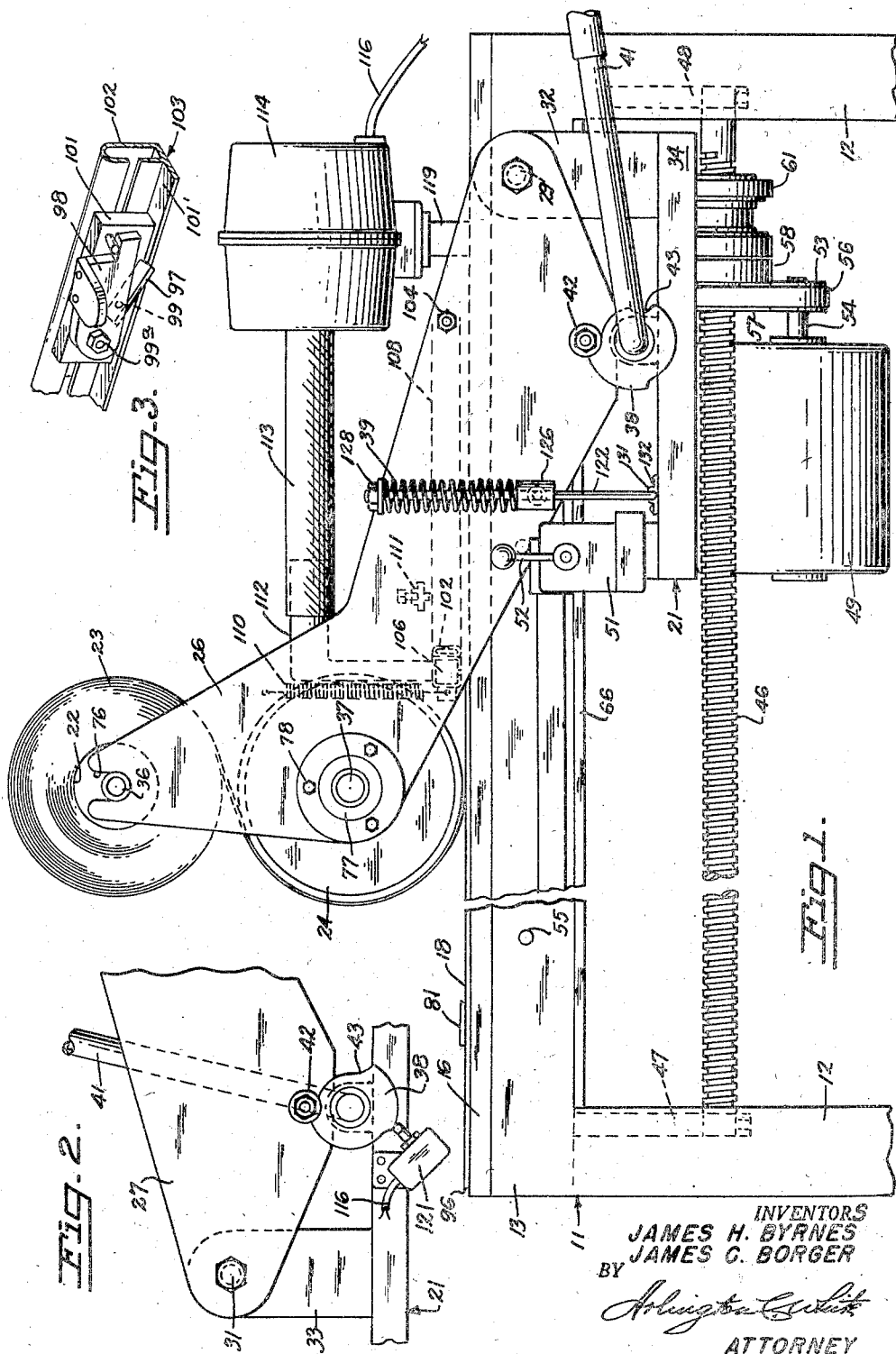


Filed Sept. 22, 1955

5 Sheets-Sheet 1

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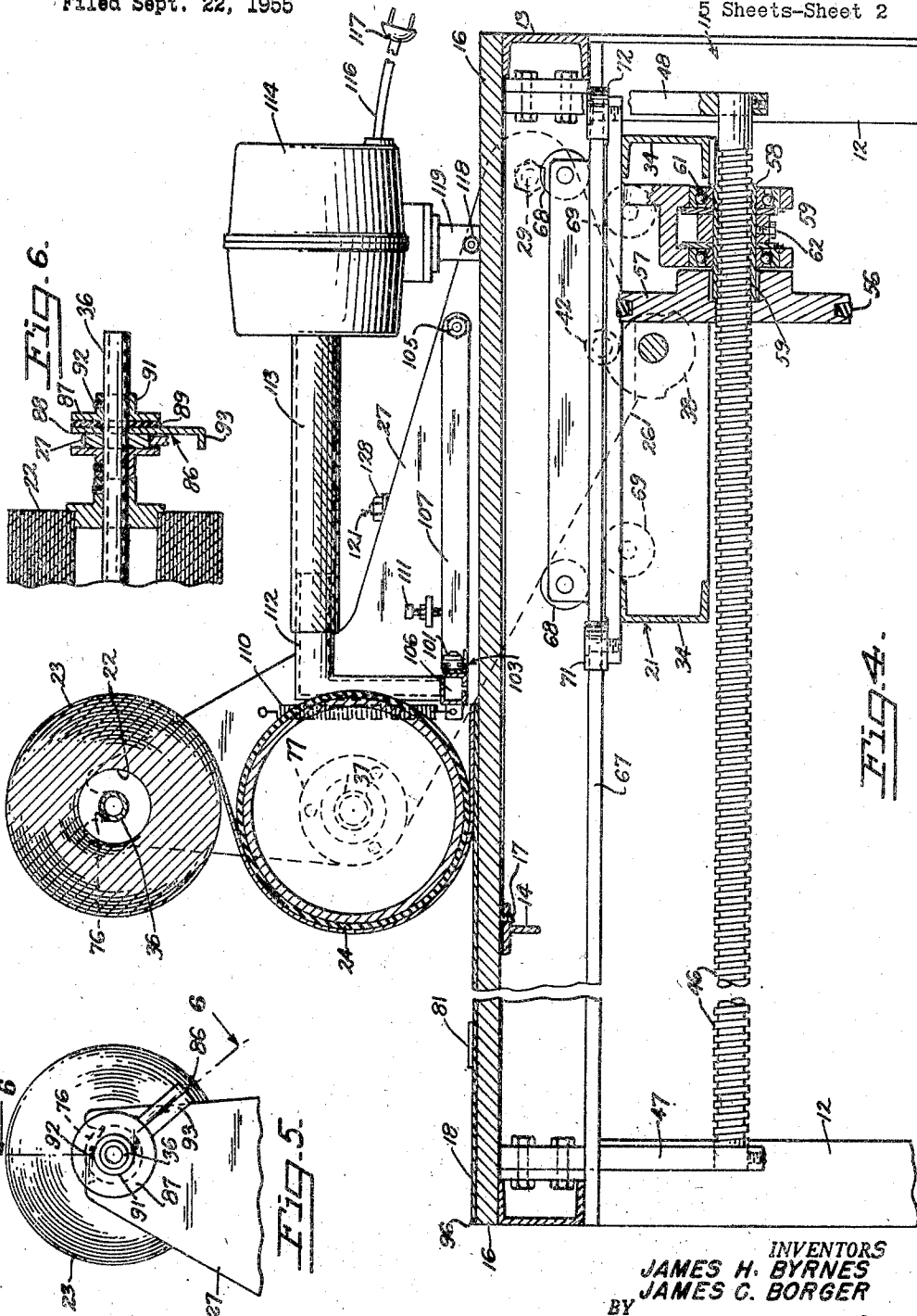
Jan. 7, 1958

J. H. BYRNES ET AL
MACHINE FOR APPLYING PRESSURE-SENSITIVE
SHEET TO FLAT OBJECTS

2,818,908

Filed Sept. 22, 1955

5 Sheets-Sheet 2



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SHEET TO FLAT OBJECTS

2,818,908

Filed Sept. 22, 1955

5 Sheets-Sheet 3

Fig. 7.

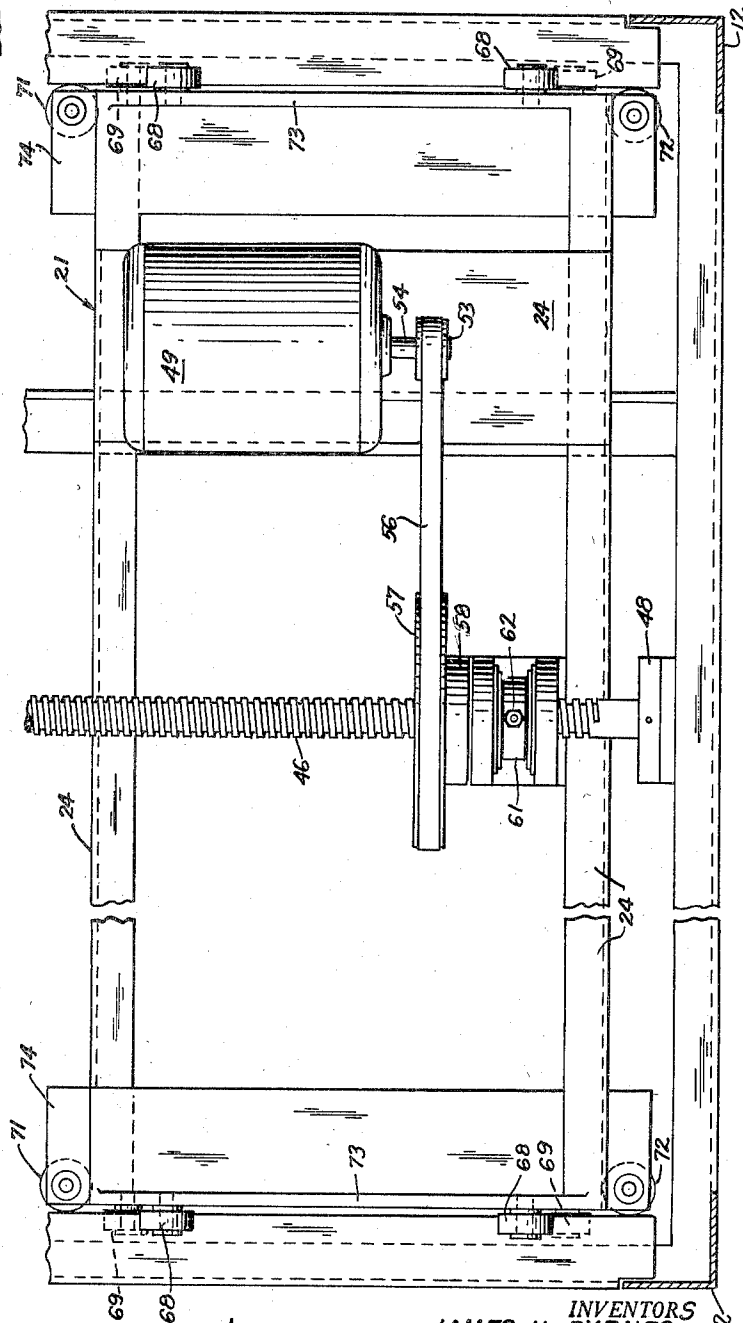
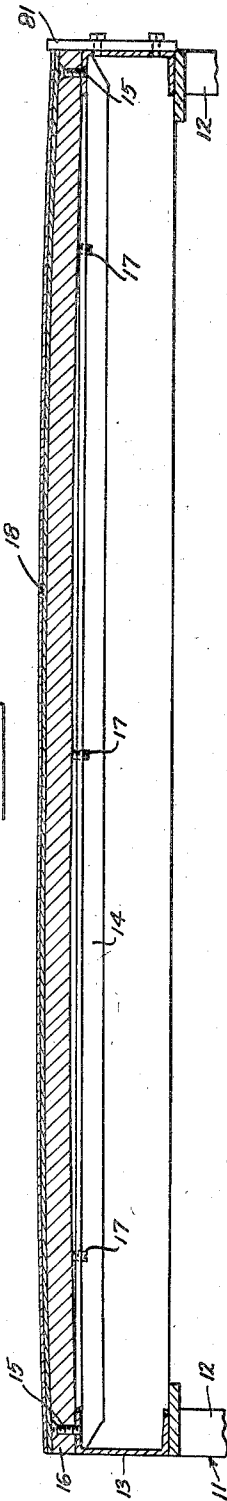


Fig. 8.

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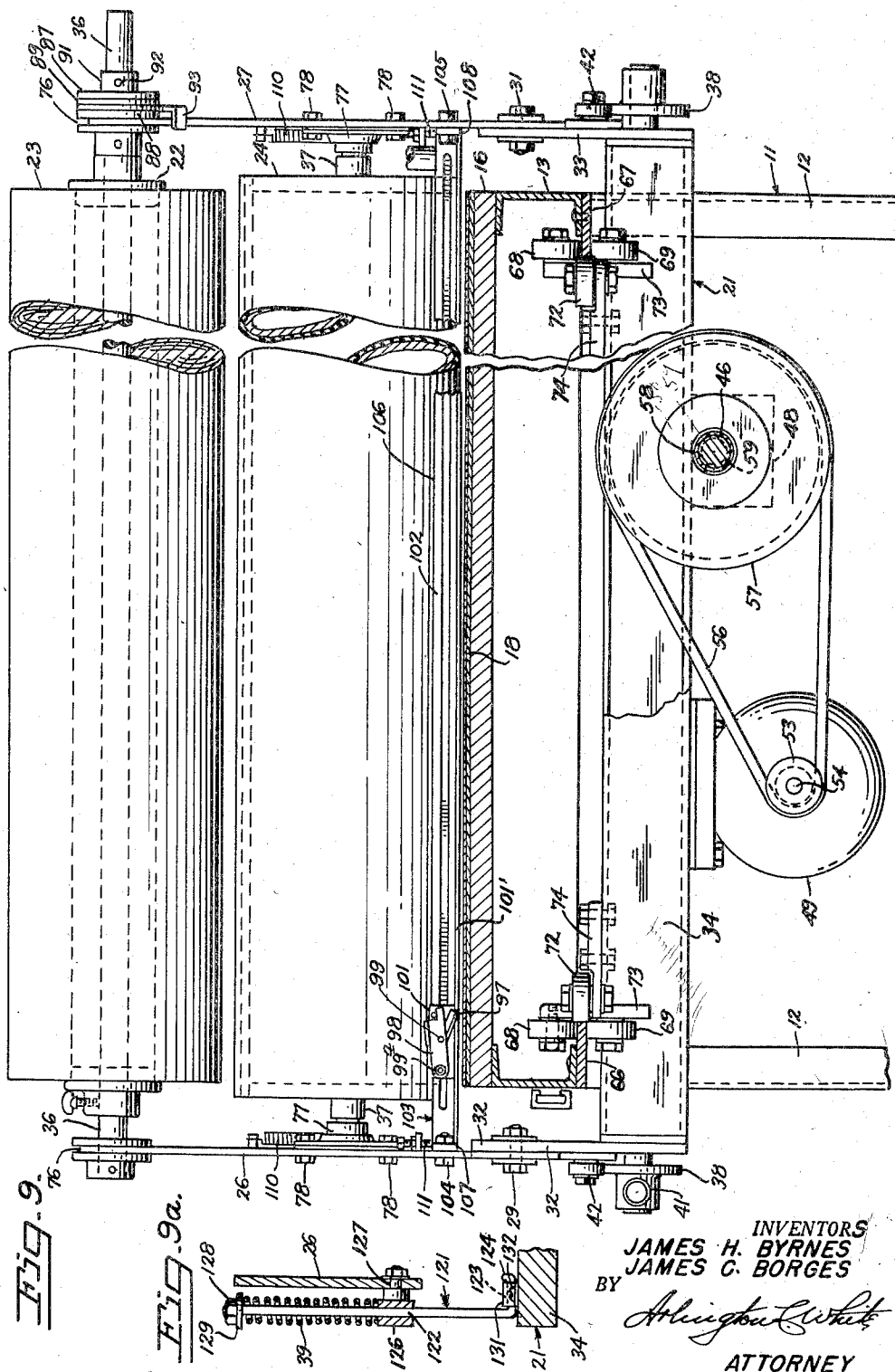
Jan. 7, 1958

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2,818,908

Filed Sept. 22, 1955

5 Sheets-Sheet 4



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MACHINE FOR APPLYING PRESSURE-SENSITIVE
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2,818,908

Filed Sept. 22, 1955

5 Sheets-Sheet 5

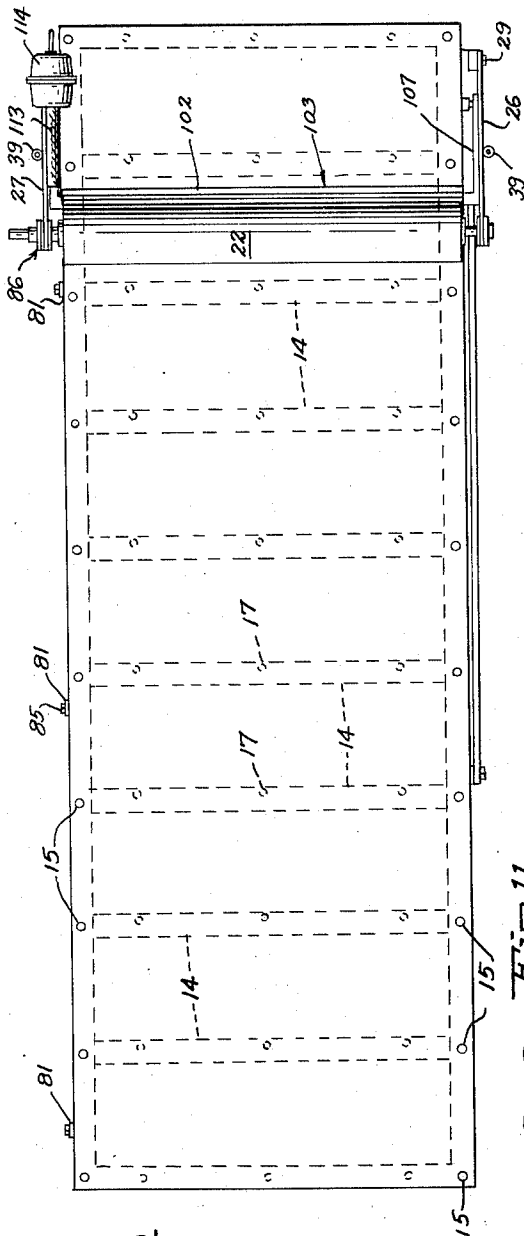


Fig. 10.

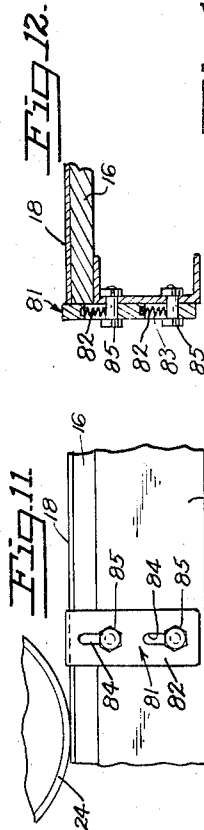


Fig. 11.

Fig. 12.

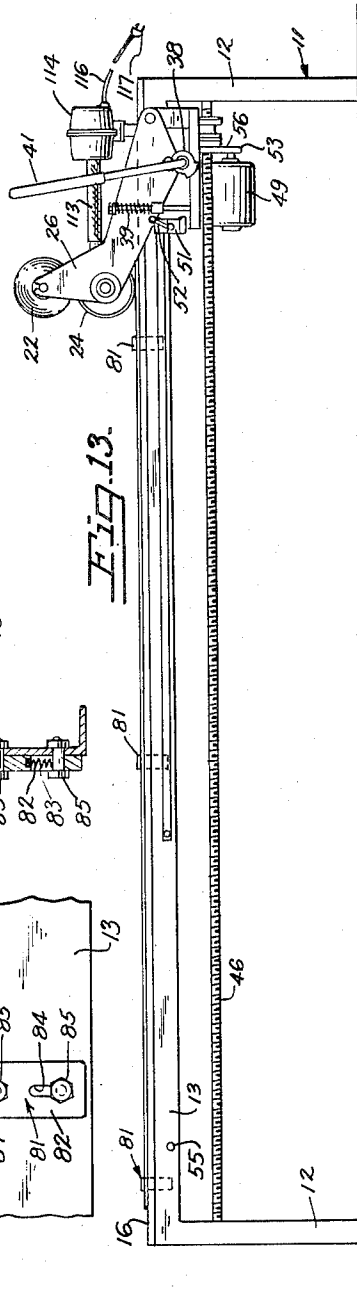


Fig. 13.

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2,818,908

MACHINE FOR APPLYING PRESSURE-SENSITIVE SHEET TO FLAT OBJECTS

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Application September 22, 1955, Serial No. 535,951

15 Claims. (Cl. 154—41)

The invention, in general, relates to devices for applying pressure-sensitive sheets to substantially flat objects. More particularly, the invention relates to a method of and equipment for applying a layer of pressure-sensitive paper stock to and in accurate registration with a polished metal surface for protecting the entire area of the metal surface end to end and side to side.

While heretofore there have been various types of machines developed for applying a pressure-sensitive sheet to a rigid surface, such as metal, many of these prior machines have not performed satisfactorily either in one respect or another. The principal difficulties encountered, and not overcome by prior art devices, are failure to accomplish accurate registration between the pressure-sensitive material and the object to which it is applied resulting in exposed areas of the object subject to damage; the tendency of the applied material to wrinkle during its application thus causing uneven application and exposed areas of the object; the formation of air bubbles trapped under the applied material and consequent separation of the applied material from the surface to which it is applied; as well as undue tearing of the sheet of pressure-sensitive material causing frequent stoppages of the machine for re-setting and often entirely re-applying of the pressure-sensitive material resulting in a considerable loss in time and added labor expenses. The present invention is directed to the provision of a unique method of application of pressure-sensitive material to objects, such as metal, plastic or like surfaces, as well as improved equipment for effecting this result which obviate all of the inherent disadvantages of prior art devices and methods.

A primary object of our invention is to provide an improved paper coating machine capable of applying a pressure-sensitive paper to a surface with complete and accurate registration of the applied paper to the entire area of the metal, plastic or like surface leaving no portion of the metal surface exposed to possible damage.

Another important object of the present invention is to provide an improved paper coating machine of the indicated nature which is additionally characterized by its capability of applying the pressure-sensitive paper continuously over a surface without wrinkling or tearing of the pressure-sensitive paper thus avoiding work stoppages, added labor expenses as well as losses in stock.

A still further object of our present invention is to provide an improved paper coating machine of the aforementioned character which affords complete application of the pressure-sensitive paper to a metal or other surface free of air bubbles between the two thus insuring against all likelihood of premature separation of the pressure-sensitive material from the metal, plastic or like surface to which it has been applied.

Another object of our invention is to provide an improved method of and equipment for applying pressure-sensitive material to a surface, which is lower in expense of application as well as speedier and more effective in performance.

Other objects of the invention, together with some of

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the advantageous features thereof, will appear from the following description of a preferred embodiment of our invention which is illustrated in the accompanying drawings. It is to be understood, however, that we are not to be limited to the precise embodiment shown, nor to the precise arrangement of the various parts thereof, as our invention, as defined in the appended claims, can be embodied in a plurality and variety of forms.

Referring to the drawings:

Fig. 1 is a broken side elevational view of a preferred embodiment of the invention, this view showing certain elements in dotted lines to illustrate the relative locations thereof.

Fig. 2 is a fragmentary side elevational detail taken from the opposite side of the machine from the view of Fig. 1 and illustrating the cam for actuating the switch governing the operation of vacuum mechanism.

Fig. 3 is a fragmentary perspective detail of the paper severing device and mounting thereof as employed in the preferred embodiment of the invention.

Fig. 4 is a fragmentary longitudinal sectional view of a preferred embodiment of the invention, portions thereof being shown in full line side elevation and portions thereof in dotted line side elevation to illustrate the relative locations thereof.

Fig. 5 is a fragmentary side elevational view of snubber means employed in the preferred embodiment of the invention for controlling the rotation of the reel holding the pressure-sensitive paper stock.

Fig. 6 is a fragmentary cross-sectional view taken on the line 6—6 of Fig. 5.

Fig. 7 is a transverse cross-sectional view of the preferred embodiment of the invention and illustrating the slight crowning of the metal surface or other sheet material to which the pressure-sensitive paper is applied.

Fig. 8 is a fragmentary plan view looking into the underside of the preferred embodiment of the invention.

Fig. 9 is a broken end elevational view, partly in section, of the preferred embodiment of our invention.

Fig. 9a is an enlarged detail, partly in section, of the hold-down elements for the carriage roller.

Fig. 10 is a top plan view of a preferred embodiment of our invention in reduced scale.

Fig. 11 is a fragmentary side elevational view of certain stop elements of the preferred embodiment of our invention.

Fig. 12 is a cross-sectional detail of the stop elements illustrated in Fig. 11.

Fig. 13 is a side elevational view of the preferred embodiment of our invention on a reduced scale.

In its preferred form, our improved paper coating machine preferably comprises a substantially rigid rectangular surface, adjustable means for providing a slight variable transverse crown in said rigid surface; said rigid surface serving to receive a succession of metal, plastic or like sheets each having a planar upper surface which assumes the slight transverse crown of said rigid surface when positioned thereon, means for accurately positioning each of the said sheets on said slightly crowned rigid surface with the sides of said sheets parallel to the sides of said rigid surface, together with means for successively applying severable lengths of continuous pressure-sensitive paper in accurate registry with each positioned sheet on said rigid surface as well as for simultaneously applying pressure to the applied lengths of paper and to each said sheet during application of the paper thereto thereby conforming the applied paper to the entire area of the upper surface of each said sheet including the slightly crowned area thereof to cause each length of applied paper to adhere to the entire area of the upper surface of each said sheet, means for severing each length of said paper at the longitudinal extremity of each of said sheets prior to re-

moval thereof from said surface, and means for grasping and retaining an end portion of the severed continuous paper for subsequent release and application to an adjacent extremity of a succeeding metal, plastic or like sheet positioned on said rigid surface.

As particularly illustrated in the annexed drawings, we provide a table structure, generally designated by the reference numeral 11, comprising a steel channel frame consisting of four channel legs 12, a bounding channel rim 13 welded to the tops of the legs 12, and a plurality of transversely arranged and longitudinally spaced bars 14, preferably of T-section, which are welded to opposite side channels of the rim 13. In addition, the table structure 11 includes a thick sheet of relatively hard substance, such as pressed wood pulp or material sold commercially under the trade-mark "Masonite," which is of the same dimensions as the table so that said substance rests on the end channels, as well as side channels, and also on the transverse bars 14 of the frame structure; the pressed wood conveniently being secured to the channels of the rim 13 by means of counter-sunk screws 15. In the present embodiment of our invention, which we have successfully used in connection with covering polished sheet metal, we have employed a table structure 11 which is approximately three feet in height, four feet in width, and twelve feet in length. Thus, the rigid surface of "Masonite" 16 which is seated upon the bounding rim 13 of the table structure has dimensions of four feet in width and twelve feet in length. Each of the transverse bars 14 of the frame structure is pierced by a plurality of transversely spaced set-screws 17 in order to effect a crowning of the pressed wood to meet variable conditions of use. The degree of crowning of the pressed wood or "Masonite" normally would not exceed .025 inch and is a transverse crowning as illustrated in Fig. 7 of the annexed drawings.

The foregoing described table structure 11 insures an unobstructed table top both laterally and longitudinally in order not only to permit metal, plastic or like sheets to be covered to be placed on the "Masonite" top 16 from one side of the table and removed from the other side but also to permit coating of metal, plastic or like sheets of unusual length and to any desired length. It should be observed that in positioning successive sheets upon the top 16 of the table, each of said sheets will assume the same slight transverse crowning as that provided in the "Masonite" top 16 by adjustment of the set-screws 17 in transverse bars 14. Moreover, each successive sheet is positioned on the top 16 with one side of the sheet parallel to the corresponding side of the table top in true rectangular relationship.

In accordance with our present invention, we provide means for applying lengths of continuous pressure-sensitive paper to the upper surfaces of a succession of polished metal, plastic or like sheets 18 removably disposed upon the top 16 of the table structure, and simultaneously for applying pressure to the applied paper, as well as to the positioned sheets, in order to insure that the applied paper will be effectively in full adhering relationship with the positioned sheet. It may be observed here that the pressure applied is a yielding pressure so that conformance is had between the pressure applicator and the slight crowning of the top 16 whereby not only does the applied paper adhere to the entire area of the upper surface of each positioned sheet, including the slight crowned area thereof, but also there will be no air bubbles between the applied lengths of paper and the metal, plastic or like surface. The aforesaid means preferably comprise a power-driven Gantry-type carriage, designated generally by the reference numeral 21, which is moved to and fro lengthwise of the table 11 and upon which is mounted a roll 22 of pressure-sensitive paper 23, which is removed from the roll 22 continuously in the operation of the machine, as well as a relatively large diameter rubber-coated roller 24 over which the unrolled paper

is trained and by virtue of which pressure is applied not only to the paper but to the positioned sheet and the "Masonite" top 16 of table 11 as the Gantry-type carriage is moved lengthwise of the table during the applying operation. The Gantry-type carriage 21 includes a pair of web sections 26 and 27 which are pivotally mounted on opposite sides of the table 11 on suitable pivot pins 29 and 31 carried in brackets 32 and 33, respectively, which are integral with the base 34 of the Gantry carriage and extend normal thereto, as shown. The web sections 26 and 27 rotatably support the shaft 36 of the roll 22 as well as the shaft 37 of the pressure roller 24; such shafts 36 and 37 being in vertical alignment as particularly shown in Fig. 1 of the annexed drawings, and are so journaled in the web sections 26 and 27 of the Gantry-type carriage that the roll 22 and the pressure roller 24 are in spaced relationship to one another. It is to be especially observed that the shafts 36 and 37 carrying the roll 22 and the roller 24, respectively, are arranged in right angle relationship to the direction of movement of the rolls or to the sides of the table top 16.

With particular reference to Fig. 1 of the drawings, it will be observed that we provide means for raising and lowering the web sections 26 and 27 of the frame 21 in order that the length of pressure-sensitive paper 23 can be properly disposed with relation to each sheet 18 to be covered preliminary to starting the application of the paper stock to the metal surface. These means preferably comprise cams 38 and springs 39; the springs 39 being relatively heavy and exerting a downward pressure normally on the webs 26 and 27 to hold the pressure roller 24 closely adjacent to the metal surface 18 that is to be covered. A lever 41 is provided for manually moving the cams 38 which bear against rollers 42 in raising the web sections 26 and 27 as well as lowering the same to raise and lower the pressure-roller 24 relative to the table top. With reference to Fig. 1, the manually operable lever 41 is thrown to the extreme right thus raising the pressure-roller 24 relative to the table top. In the view of Fig. 13, the lever 41 has been thrown to the left bringing the rollers 42, which are rotatably mounted on stub shafts extending through the web sections 26 and 27, into the depression 43 of cams 38 and thus the pressure-roller as well as the paper roll have been lowered to their lowest position with pressure-roller 24 in engagement with the top surface of the sheet to be covered, and the machine is ready for operation in the application of the lengths of pressure-sensitive paper 23 to the upper surface of the sheet 18.

In accordance with our invention, means are provided for moving the entire Gantry-type carriage to and fro longitudinally of the table 11 and to this end we provide a longitudinally extending worm 46 which is rigidly supported by means of depending end brackets 47 and 48 so that the worm 46 spans the brackets 47 and 48 at the transverse center of the table 11 below the top thereof as well as slightly below the Gantry-type frame base 34, see Fig. 4 of the annexed drawings. In addition, these means include a combined reversing motor and magnetic brake 49 which is connected into an electrical circuit, not shown, and controlled through a switch 51 thrown from one position to another by means of the hand lever 52, see Fig. 1, and which is placed in driving connection with the worm 46 in any suitable manner, such as a pulley and belt drive consisting of a small pulley 53 on motor shaft 54; and the belt 56 which is trained over the pulley 53 as well as over a pulley 57 keyed to a sleeve 58 having complementary threads 59 formed therein for engaging the threads of the worm 46. To complete the driving connection between the reversing motor 49 and the worm 46, we provide a rotatable nut 61 which is welded or otherwise secured to the sleeve 58 and rotates therewith upon the rotation of the pulley 57 with the motor in operation. In the present embodiment of the invention the rotatable member 61 is bolted

to the sleeve 58 by means of the bolt 62, see Fig. 8 of the drawings.

With further reference to Figs. 1, 4, 8 and 9 of the annexed drawings, it will be observed that the casing of reversing motor 49 is integral with or can be welded to the underside of the base 34 of the Gantry-type carriage 21 at one side thereof with the casing of switch 51 secured to the top of the base 34 of the carriage above the motor. With this arrangement, the entire drive mechanism including motor and magnetic brake 49, the belt and pulley connections between the motor shaft 54 and worm 46, as well as the control switch 51, travel lengthwise of the table 11 on the worm shaft 46 along with the carriage 21. With the carriage 21 at the extreme right, as shown in Fig. 1, lever 52 of switch 51 may be thrown to start the motor 49 and cause the carriage to move to the left for the entire distance of the worm shaft 46 where the motor automatically is stopped and the magnetic brake becomes effective to hold the carriage 21 at rest until the severance of the paper is completed. Thereafter, lever 52 is manually moved to cause the switch 51 to move to its opposite contacts, the motor 49 is thus reversed and the carriage 21 will travel towards the right and be brought to rest at the extreme right or in the position as shown in Fig. 1 of the drawings by the contact of lever 52 with an adjustable stop, not shown, to throw lever 52 to neutral position. The carriage 21 is guided in its travel by a pair of steel rails 66 and 67, secured below the top 16 of the table at opposite sides of as well as parallel to the sides of the table 11, together with sets of spaced pairs of rollers 68 and 69 which ride upon the tops and bottoms of rails 66 and 67, respectively, as well as by sets of spaced rollers 71 and 72 which bear against the sides of the rails 66 and 67. These various sets of rollers are journaled in bearings contained in frame sections 73 and 74 formed integral with and projecting from the base 34 of the carriage 21. By this construction, side-play of the carriage 21 is entirely prevented and the carriage moves in a straight line end to end of the table 21 in both directions of travel.

As shown particularly in Figs. 1 and 9, in the Gantry-type of mounts for the roll 22 and roller 24, the web sections 26 and 27 terminate at their upper extremities in yoke sockets 76 in which the shaft 36 of the roll 22 carrying the roll of pressure-sensitive paper 23 is seated. Directly below the sockets 76 and in vertical alignment therewith, the web sections 26 and 27 are provided with horizontally aligned, suitably apertured bearings 77 which are fixedly secured in position on the web sections by means of bolts 78 and in which is journaled the shaft 37 carrying the relatively large pressure-roller 24. The arrangement of the bearing 77 with respect to the yoke sockets 76 of the web sections 26 and 27 is such that there is provided a space between the roll 22 and roller 24, as shown in Fig. 1. The roll 22 and roller 24 are made coextensive in width to the width of the table 11 so that sheets 18 of similar width can be completely coated side to side with the pressure-sensitive paper. By virtue of this Gantry roll mounting just described, upon the travel of the carriage 21 from right to left, viewed from the showing of Fig. 1, the pressure-sensitive paper 23 will unroll from its roll 22 and will train around a portion of pressure-roller 24 and, by virtue of the movement of the carriage 21 and its associated web sections 26 and 27 as well as the influence of the heavy springs 39 holding down the web sections, the paper 23 will be pressed firmly against the upper surface of the sheet 18 and applied thereto throughout the entire length and width of sheet 18 as the carriage 21 continues to travel the length of the table 11.

The method and equipment of our present invention effects accurate registration of the applied paper stock 23 to each sheet 18 placed on the top 16 of the table because not only is the construction such as to afford a right angle

relationship between the paper roll shaft 36 and the side edges of the table 11 when the paper is being applied and the carriage 21 is being guided along rails 66 and 67 secured in rigid parallel relationship with the lateral edges of the table, but also because each sheet 18 to be covered is constrained against any movement on the table top by virtue of the great friction created between the rubber roller 24 and each sheet 18 which is aligned on the "Masonite" top 16 by being initially, in each instance, placed firmly against a plurality of stops 81 secured to and arranged in spaced relationship along one channel side of table 11; the table being constructed in true rectangular shape with the sides at right angles to the ends thereof. Each of the stops 81 is spring mounted so that as one lateral edge portion of the rubber roller 24 advances from one end of the table to the other in applying the pressure-sensitive paper 23 to the sheet 18 disposed on the table against the stops 81, each spring mounted stop 81 is depressed by the roller 24, because of its width, into its socket mounting 82 against the influence of a socket-containing spring 83; each spring 83 being anchored at one end to its corresponding socket and at its other end to the corresponding stop element 81, all as shown in Figs. 11 and 12 of the drawings. To permit the depression and return to normal position of each stop element 81, a pair of spaced slots 84 are formed in each stop member for passing bolts 85 which secure the mounting member 82 of each stop to the channel side of the table structure 11.

In order to insure that the pressure-sensitive paper 23 unrolls evenly from the roll 22 without wrinkling and at a uniform rate, we provide a friction member which is generally designated in the drawings by the reference numeral 86 and which effects a slight braking or snubbing action on the shaft 36 of roll 22. As shown in Figs. 5 and 9, the friction member 86 comprises two opposed metal discs 87 and 88 with a fiber disc 89 therebetween to retard any free relative rotation of the metal discs; the metal disc 87 being provided with a collar 91 for securing this disc by means of a metal screw 92 to the roll shaft 36, and the metal disc 88 including an integral projecting hook element 93 which engages the web section 27 of the Gantry-type carriage thereby holding the metal disc 88 in a fixed position relative to shaft 36 and acting as a brake thereon.

In accordance with our invention, means are provided for manually severing the paper stock 23 evenly along the outer extremity 96 of each sheet 18 after the pressure-sensitive paper 23 has been applied to each sheet, and means also are provided for grasping and retaining the free severed extremity of the length of paper 23 during the return movement of the carriage 21 and until the pressure applying roller 24 is again lowered to operative position for applying a succeeding length of the pressure-sensitive paper 23 to a succeeding polished metal or plastic sheet 18 positioned on the top 16 of the table; these latter means permitting the free return of the carriage 21 and supported roll 22 and roller 24 to their initial positions without having the paper 23 trailing and without requiring adjustments when starting to coat or cover a new sheet 18.

The severing means preferably comprises a relatively sharp blade 97 which is fixedly secured to a blade actuator 98 pivotally mounted by means of a pivot pin 99 on a block 101 which, in turn, is slidably mounted on the base 101' through the medium of a slotted projecting member 102 of a guide 103 by means of the pin 99a which extends through the slot of member 102. To insure that the paper 23 is cut just beyond the covered sheet 18, or at its outer extremity 96, and, further, that the cut is accurate in the sense that it is parallel to the axis of roll 22 carrying the paper 23, the guide 103 is fixedly secured to the side web sections or roll mounts 26 and 27 by means of bolts 104 and 105, respectively, and in close proximity to the paper grasper and retainer hereinafter described

as well as closely adjacent to the roll 22 and pressure-roller 24, see Figs. 4 and 9 of the annexed drawings.

The paper grasping, retaining and releasing means of the preferred embodiment of our invention, preferably comprises a vacuum operated paper holder consisting of a perforated tube 106 carried on the outer extremities of arms 107 and 108 which are pivotally mounted by means of pins 109 fixed to the side web sections 26 and 27 of the Gantry roll mounts in order that the perforated tube 106 can be manually lowered against the action of springs 110, anchored between the web sections and the tube, into close proximity to the table top 16 for convenient grasping of the paper 23 after it has been severed and when suction is applied; the arms 107 and 108 being limited in the opposite direction under the force of springs 110 by stops 111 fitted onto the web sections 26 and 27. The perforated tube 106 is placed in communication, by means of an elbow 112 and the flexible tube 113, with a conventional combined pump and motor 114, which may be a motor-driven fan if desired, the motor of which is connected by means of a cord 116 and a plug 117 to a source of electrical energy, not shown, for operating the motor. The vacuum pump 114 is mounted for movement with carriage 21, being rigidly affixed to the web sections or roll mounts 26 and 27 of the Gantry-type carriage 21 by means of bolts 118 extending through the web sections and through a standard 119 on which the pump 114 is mounted; the pump being controlled by a suitable switch 121 actuated by cam 38 on the pump side of the machine when lever 41 is thrown as hereinafter described.

Before describing generally the operation of the machine, reference is made to Fig. 9a of the annexed drawings which illustrates the mounting of the heavy springs 39 that hold down the roll mounts and supported roll 22 and roller 24 during the travel of carriage 21 and the application of the paper 23 under pressure to the sheets 18 placed on the table. As shown, each spring mounting comprises a rod 121 which includes a long straight section 122 and a short projection 123 extending at right angles to section 122 that terminates in a curved tip 124, together with a collar 126 having longitudinal and transverse bores therethrough for passing the rod section 122 as well as a pin 127 by means of which the springs are pivotally connected to the web sections 26 and 27 of the Gantry roll mounts, only one spring mounting and one web section 26 being shown in Fig. 9a. The collar 126 is fixedly secured to rod section 122 and the outer extremity of rod section 122 is threaded for receiving a nut 128. The spring 39 of each spring mounting is coiled about rod section 122 and is confined between an associated collar 126 on such rod section as well as a washer 129 backed up by the nut 128 and, consequently, each spring 39 is under compression. Each rod 121 of each spring mounting projects normally from the base 34 of the Gantry-type carriage 21 at opposite sides thereof and is firmly secured to the base by means of a clamp 131 and metal screws 132; the projections 123 of the rods 121 passing under the clamp and being additionally restrained against tilting or lateral movement by the curved tips 124 at the extremities of the rod projections 123. Since the springs 39 are connected to the roll mounts 26 and 27 and since the springs are under compression, their influence is always exerted downwardly towards the base 34 of the carriage 21 and the tendency of the springs is to hold the pressure roller 24 against the table top and to exert heavy pressure upon each metal sheet 18 during the application of the pressure-sensitive paper 23 thereto. The roller 24, of course, is raised from the table top, after each application and after each severance of the paper at the outer extremity 96 of each sheet 18, by throwing the manually operable lever 41 to the right to bring the rollers 42 out of depressions 43 as shown in Fig. 13 onto the raised portion of cam 38 as shown in Fig. 1; the machine thus being placed in condition for the application of a succeeding length of pressure-sensitive paper 23

to a succeeding polished metal sheet, or a plastic or other sheet to be coated.

In carrying out our improved method of application and operation of our improved machine for coating polished metal sheets or plastic or other sheets with a pressure-sensitive paper, assuming the carriage 21 to be at rest at the extreme right of the machine as viewed in Fig. 1, the operator initially throws lever 41 to the position shown in Fig. 1 of the drawings and workmen lift a sheet 18 to be coated from a stack of such sheets on one side of the machine and position the sheet on the top 16 of the table with the far edge of the sheet 18 abutting the stops 81 at the far side of the table so that the sheet 18 is squared in right angle relationship to the table top. The operator then manually unrolls a portion of the paper 23 from roll 22 and brings it around and under roller 24 to the near end or extremity of sheet 18 which underlies the roller 24. At this stage of the operation, the vacuum pump 114 is idle and no suction is being drawn through tube 106 so the operator or workmen manually flatten out the coated surface of the pressure-sensitive paper 23 onto that portion of the sheet 18 extending beyond or to the rear of the roller 24. Lever 41 is then thrown to the left to lower the pressure roller 24 into engagement with the paper stock 23 immediately below the roller and this action brings the springs 39 under full compression thereby causing the roller 24 to exert a heavy pressure on the underlying sheet 18. Simultaneously with the lowering of the roller 24, the motor 49 is started by throwing switch lever 52 to the right, as shown in Fig. 13, which causes the carriage 21 and all units and mechanisms connected therewith to move towards the left or to the opposite end of the table, including the Gantry roll mounts 26 and 27. Movement of the carriage 21 causes the constant and uniform rotations of shafts 36 and 37 by reason of the movement of the Gantry roll mounts 26 and 27, and this effects the transfer of the pressure-sensitive paper 23 from roll 22 to the applicator or pressure-roller 24 which, in turn, transfers and applies the paper to the sheet 18 throughout its entire length as well as its entire width inasmuch as the length of the roll 22 and the roller 24, in each instance, is equal or greater than the widths of each sheet 18 to be coated.

When the carriage 21 reaches the end of worm shaft 46 the motor switch lever 52 is thrown to neutral by its contact with limit stop 55 to stop the motor 49 and, of course, the movement of carriage 21. The operator then throws lever 41 to the right again which raises the roller 24 from the table top and by such throw of the lever turns the cam 38 on the opposite side of the table into engagement with and thereby closes the switch 121 to start the vacuum pump 114, thus causing air suction through tube 106. A workman simultaneously depresses the blade actuator 98, which is in its normally rest position at the extreme side of the table top, to engage the paper stock 23 with blade 97 at the outer extremity 96 of sheet 18, and draws the blade 97 across the table top to the opposite side by sliding the block 101 thereby accurately cutting the paper parallel to the axis of roll 22. The severed end portion of the paper 23 is immediately drawn by suction against the underside of tube 106 and is retained on the tube by virtue of the continuous operation of the vacuum pump 114. The operator then throws motor switch lever 52 in the opposite direction, or to the left, thereby actuating the reversing motor 49 to cause the travel of carriage 21 in the reverse direction and back to its initial position where the motor is stopped when switch lever 52 contacts the opposite limit stop, not shown, at the right of the table.

The workmen meanwhile remove the paper-coated sheet 18 and position a succeeding metal sheet 18 on the table top in the same manner as before. The lever 41 is again thrown to the left to lower the pressure-roller 24 to the table top again; such throwing of lever 41 caus-

ing the cam 38 at the opposite side of the table to disengage and to open the switch 121 stopping the vacuum pump 114 which effects simultaneously the release of the paper 23 from the underside of the tube 106. The operator or any workman then flattens out the paper stock onto that portion of the metal sheet 18 extending to the rear of the roller 24, the motor 49 is again started for moving carriage 21 along the table, and the cycle is repeated again and again until all sheets 18 at hand have been coated with the pressure-sensitive paper. It may be observed that as the roller 24 passes over each of the stops 81, these stops all return to their initial positions projecting above the top 16 at one side of the table for functioning to align the succeeding metal sheets 18 placed on the table top to be coated.

We have successfully carried out our improved application method and operated the described improved machine with no wrinkling or tearing of the paper 23 and without the creation of air bubbles between the applied pressure-sensitive paper and the upper surface of the coated sheet 18. The feature of crowning the top 16 of the table structure by turning up or turning down of the set screws 17 of the transverse bars or laterals 14 has been proved to be highly effective in precluding the occurrence of air bubbles. Since the levelling or crowning of the top 16 is accomplished by means of set screws, varying conditions as may be required by sheets 18 of different thicknesses, or temper, or camber, may readily be met and compensated for. It also may be observed that the heavy pressures exerted by springs 39, enhanced by the friction created by the pressure of the roller 24 against the sheet 18, prevents the sheet 18 from moving or shifting during the application of the pressure-sensitive paper thereto.

The provision of the friction device composed of the fiber disc 89 between metal discs 87 and 88 overcomes all problems of unrolling of the paper stock 23 from roll 22; our experience with such arrangement being that the paper unrolls evenly and smoothly with no appearance of wrinkles or any tearing of the stock. It is noted in this regard that the paper-controlling roll is also the pressure roll and we have thus accomplished additional savings in construction costs over prior machines which heretofore have necessarily used a plurality of rolls to control the transfer of the paper.

As indicated above, the pressure-roller 24 is rubber-coated. We have found that this rubber covering may be of a relatively soft rubber, such as a rubber of approximately 30-40 durometer, which readily conforms to the transversely crowned table top without affecting the applied pressure of the roller; the contacting area of the rubber covering becoming generally concave as against a generally convex area provided by the slightly crowned table top as the pressure-roller moves thereover. The pressure-roller 24 thus affords a squeegee effect to spread the applied paper evenly over the entire area of the upper surface of the positioned sheets 18 without the formation or occurrence of air bubbles between the applied paper and the upper surface of the sheet.

Since the positioned sheets, in each instance, afford a true rectangular relationship between the positioned sheets and the table top 16 and since the Gantry-type carriage is so constructed and arranged for supporting the paper roll 22 and pressure-roller 24 with their respective shafts at right angular relationship to the sides of the table top, there is always an accurate registration of the applied paper to the underlying positioned sheet 18 and therefore no exposed areas exist on sheets coated by our improved equipment. The method of applying pressure-sensitive paper as herein described is especially advantageous to steel mills, steel fabricators, steel warehouses, as well as to all those marketing plated strip steel, since our equipment furnishes a protective surface to the sheet steel or strip steel whether it be in storage or in transit.

It is to be understood that the appended claims are to

be accorded a range of equivalents commensurate in scope with the advance made over the prior art.

We claim:

1. A paper coating machine comprising, in combination with a roll of pressure-sensitive paper, a table having a rectangular upper surface upon which a succession of sheets may be positioned for paper coating operations, means for coating each sheet positioned on said upper surface with a length of pressure-sensitive paper from said roll applied in accurate registry with each said sheet; said means comprising a plurality of stops arranged in spaced relationship along one longitudinal marginal edge of said table for positioning each sheet to be coated in true rectangular relation with said upper surface, a carriage including a framework, a pair of roll mounts pivotally mounted on said framework at opposite sides of said table; one of said pair of mounts rotatably supporting said roll of pressure-sensitive paper, a pressure-roller rotatably mounted in the other of said pair of mounts; the axis of said pressure-roller being in right angle relationship to said one longitudinal marginal edge of said table and directly underlying the axis of said roll and parallel thereto, said pressure-roller being adapted to receive paper unrolled from said roll, means for pivoting said roll mounts to lower and raise said pressure-roller and said roll in unison to place said pressure-roller in pressure-engagement with each said sheet positioned on said table and to disengage said roller from each said sheet, means for effecting periodic forward movement of said carriage from one end of said table to the other and for effecting the unrolling of paper from said roll as well as for applying through the medium of said pressure-roller a continuous length of paper to each sheet positioned on said table, means for severing the sheet-applied continuous length of paper from the paper remaining on the roll at the end point of application thereof to each said sheet, means for effecting the return movement of said carriage to its initial position, means for grasping and retaining the severed free end of the paper on the return movement of said carriage to its initial position, and means for releasing said severed free end of the paper from said last named means upon the initiation of each succeeding forward movement of said carriage for applying a successive length of the pressure-sensitive paper to a succeeding sheet positioned on the upper surface of said table.

2. A paper coating machine comprising, in combination with a roll of pressure-sensitive paper, a table upon which a succession of sheets to be coated may be positioned, a carriage including a framework, means on said framework for mounting said roll for rotation, a pressure-roller journaled in said framework with its axis arranged at right angles to the longitudinal marginal edges of said table and parallel to the axis of said roll; said pressure-roller being adapted to receive paper unwound from said roll, means for moving said carriage periodically in a forward as well as a return direction from an initial position at one end of said table to the opposite end thereof and back to initial position, means operable during the movement of said carriage in a forward direction for effecting rotation of said roll and said pressure-roller to train paper about said pressure-roller unwound from said roll for application to successive sheets positioned on said table, and means for severing the paper from said roll at the end point of application of a length thereof to each sheet positioned on said table.

3. A paper coating machine comprising, in combination with a roll of pressure-sensitive paper and a table upon which a succession of sheets may be positioned, a carriage movably supported on said table, a pair of roll mounts on said carriage; one of said mounts serving to rotatably support said roll, a pressure-roller journaled in the other of said roll mounts and rotatable upon the movement of said carriage; the axes of said roll and pressure-roller being parallel and arranged at right angles to one longitudinal marginal edge of a sheet positioned on said

table, means for lowering said pressure-roller into pressure-engagement through the paper with a sheet on said table during forward movement of said carriage, means for periodically moving said carriage in a forward direction from an initial position to one end of said table and for returning the carriage to its initial position, and means for unwinding a length of pressure-sensitive paper from said roll and applying the same to the upper surface of a sheet positioned on said table.

4. A paper coating machine as defined in claim 3, and means for severing the pressure-sensitive paper along the end of each sheet upon completion of the application of a length of said paper thereto, and means for grasping and retaining the severed end of said paper during the return movement of said carriage for subsequent release and application to a succeeding sheet positioned on said table.

5. A paper coating machine as defined in claim 3 including means for severing the pressure-sensitive paper at the end point of application thereof to a sheet, means for grasping and retaining the severed end of said paper during the return movement of said carriage, and means for releasing the severed end of said paper from said last named means simultaneously with the actuation of said means for lowering said pressure-roller into pressure engagement with a succeeding sheet positioned on said table.

6. A paper coating machine comprising, in combination with a roll of pressure-sensitive paper, a table having an upper transversely crowned surface upon which a succession of sheets to be coated may be set in a predetermined fixed location thereon, each sheet assuming the transverse crown of said upper surface of said table, means for rotatably supporting said roll of pressure-sensitive paper, a pressure-roller rotatably supported intermediate said roll and said table and around which the paper from said roll is trained during rotation of said roll and said pressure-roller and means for applying a length of the pressure-sensitive paper to each sheet positioned on said table and for preventing the occurrence of air bubbles between the applied lengths of paper and the underlying sheet to avoid premature separation of the paper from the sheet; said means comprising means for moving said roll and said pressure-roller lengthwise of said table with said pressure-roller in rolling pressure engagement through the paper with the upper transversely crowned surface of a sheet so set on said table surface to effect the application of a length of paper under pressure to each sheet so set on said table surface.

7. A paper coating machine as defined in claim 6, and means for severing said pressure-sensitive paper along the end of each sheet after completion of application of a length thereof to the entire area of each sheet, and means for grasping and retaining the severed end of said paper adjacent the end of each sheet on said table for subsequent release and application to a succeeding sheet so set on said table surface.

8. A paper coating machine comprising a table, means on said table for providing an adjustable transversely crowned upper surface thereon; said table being adapted to receive and hold in a fixed predetermined location thereon a succession of sheets each of which assumes the transverse crown of said surface when held thereon, means for successively applying under pressure lengths of pressure-sensitive paper to successive sheets held on said upper surface of said table, means for severing the lengths of pressure-sensitive paper at the end of each sheet after each application of said paper to a sheet, and means for grasping and retaining the severed end of said paper adjacent to the end of each sheet for subsequent release for application to a succeeding sheet received and held on said upper surface of said table.

9. A paper coating machine comprising, in combination with a roll of pressure-sensitive paper, a table having an adjustably transversely crowned upper surface for removably receiving and holding a succession of sheets to be

coated; each of such sheets assuming the transverse crown of said upper surface of said table when placed and held thereon, a Gantry-type carriage supported on said table; said carriage including a pair of opposed roll mounts arranged on opposite sides of said table and projecting above the same; said roll mounts rotatably supporting said roll of pressure-sensitive paper, a pressure-roller journaled in said roll mounts and having its axis arranged below and parallel to the axis of said roll; said pressure-roller being adapted to receive a portion of said pressure-sensitive paper trained around its periphery, means for moving said carriage to and fro lengthwise of said table, means for lowering said pressure-roller into pressure engagement through said paper with the upper surface of each sheet positioned and held on said table upper surface, and means for severing the length of paper at the end point of application to each sheet, and means for grasping and retaining the severed end of said paper for subsequent release and application to a succeeding sheet positioned and held on said table surface.

10. A paper coating machine as defined in claim 9 wherein said last named means comprises a vacuum system including a perforated tube supported in overlying relation to said table surface, and means for applying suction through said perforated tube to grasp the severed end of said paper adjacent to the end of each sheet coated with said paper and to retain the same against the underside of said tube.

11. In a paper coating machine, the combination with a roll of pressure-sensitive paper of a table upon which a succession of sheets may be set in a predetermined fixed location thereon, a pressure-roller over which paper from said roll is trained as it is unwound from said roll, a carriage movably mounted on said table and supporting said roll and said pressure-roller, means for driving said carriage in both a forward and a return direction to rotate said roll and said pressure-roller and unwind said paper from said roll, means for lowering and raising said roll and said pressure-roller in unison with relation to the top of said table and a sheet so set thereon, and means actuated by the lowering and raising of said pressure-roller for releasing a free severed end of said length of paper at the initial point of application thereof to a sheet as well as for grasping and retaining a succeeding free severed end of said paper upon severance thereof at the end point of application of such length of paper to an underlying sheet so set on said table.

12. In a paper coating machine, a table for receiving and holding a succession of sheets to be coated in a predetermined fixed location on said table, a carriage movably mounted on said table, means including a worm shaft fixedly secured to said table for moving said carriage back and forth lengthwise of said table, paper coating means supported on said carriage and movable therein for coating each sheet set on said table with a continuous length of pressure-sensitive paper, means for severing said continuous length of paper at the end application of a length thereof to an underlying sheet, means for lowering and raising said paper coating means relative to said table and a sheet set thereon, and means actuated by the raising and lowering of said paper coating means for releasing a severed end of said length of paper at the start of application thereof to an underlying sheet as well as for grasping and retaining a succeeding severed end of said length of paper at the end point of application of a length of said paper to an underlying sheet.

13. In a paper coating machine, the combination with a rotatably mounted roll of pressure-sensitive material, of a table for receiving and holding a succession of sheets to be coated in a predetermined fixed location thereon; said table underlying said roll, a pressure-roller rotatably mounted adjacent to said roll and over which a continuous length of said paper is trained, means for effecting the rotation of said roll and said pressure-roller to transfer paper from said roll into adhering engagement

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with the upper surface of a sheet held by said table, means for maintaining said roll and said pressure-roller at rest in a non-coating position, and means for grasping and retaining a free severed end of said length of paper during intervals when said pressure-roller is in a non-coating position.

14. A paper coating machine comprising a table having an upper surface which is slightly crowned transversely thereof from end to end of the table, adjustable elements on the table for varying the extent of the transverse crown in said upper surface of said table; said transversely crowned upper surface of said table serving to hold a succession of sheets removably positioned thereon each of which assumes the transverse crown of said upper surface of said table, and means for successively applying under pressure lengths of pressure-sensitive paper over the entire area and in accurate registry side to side and end to end with the upper transversely crowned surface of each sheet positioned on said table surface, the assumed transversely crowned surface of each sheet and the pressure application of the lengths of pressure-sensitive paper thereto causing the adherence of the paper to each said sheet and preventing the occurrence of air bubbles between the applied paper and the underlying sheet during the pressure application of the paper thereto.

15. A paper coating machine comprising a table having an upper surface upon which a succession of sheets may be removably positioned; said upper surface of said table being transversely crowned from end to end thereof so

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that each sheet removably positioned thereon assumes the transverse crown of the upper surface of said table, and means for successively applying lengths of pressure-sensitive paper over the entire area and in accurate registry with the upper surface of each sheet positioned on said table surface without the occurrence of air bubbles between the applied paper and the underlying sheet during the application of the paper thereto; said means comprising a pressure roller over which a continuous length of pressure-sensitive paper is trained, and means for moving said roller in pressure engagement with a sheet positioned on said transversely crowned table surface to apply the paper in adhering relationship to the upper surface of the sheet and simultaneously to squeeze out air that might otherwise become entrapped between the applied paper and the sheet.

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