Feb. 15, 1938. T. F. BRACKETT 2,108,193

SANDING MACHINE

Filed Oct. 30, 1936 5 Sheets-Sheet 1

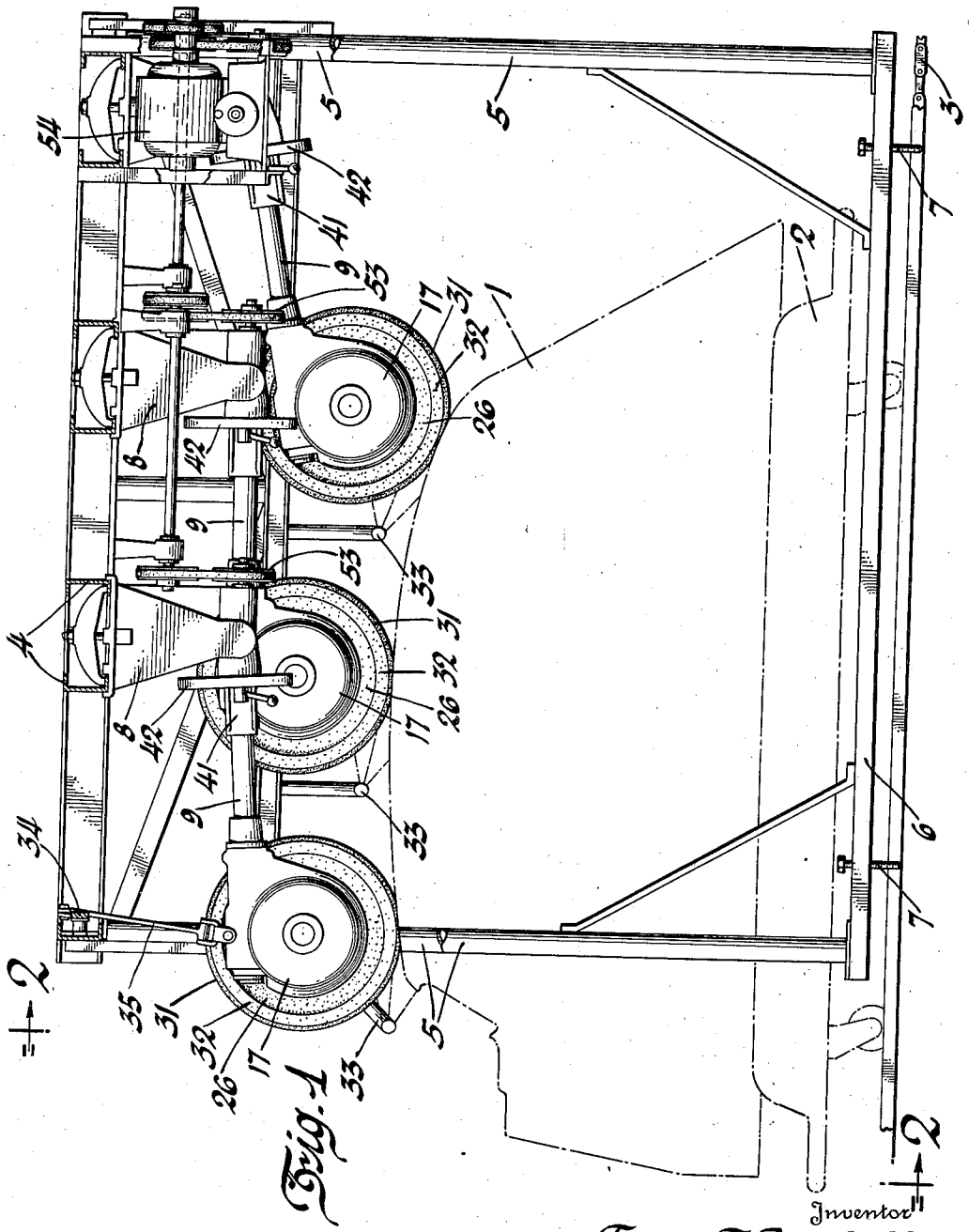

Fig. 1

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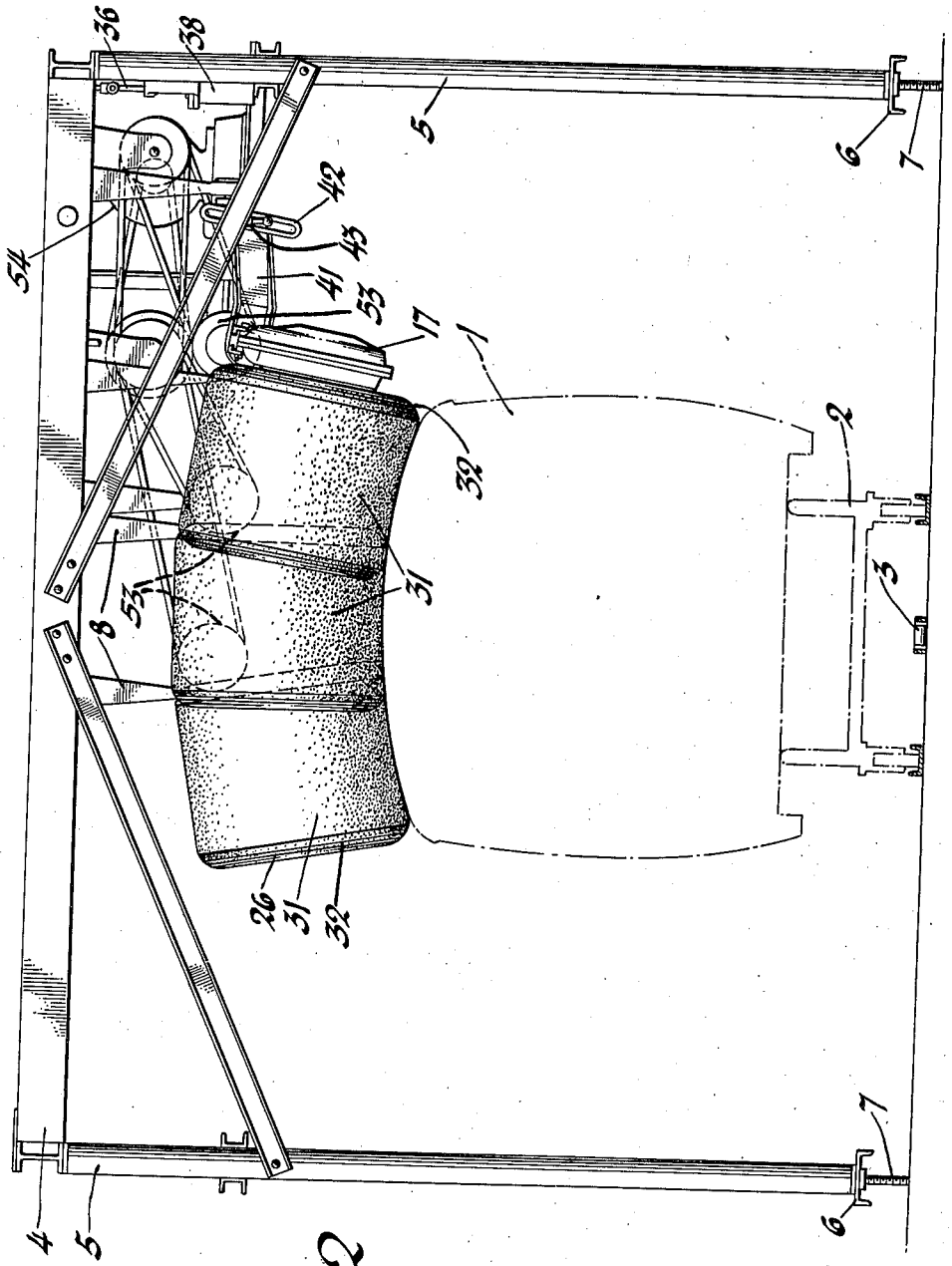

Fig. 2

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SANDING MACHINE

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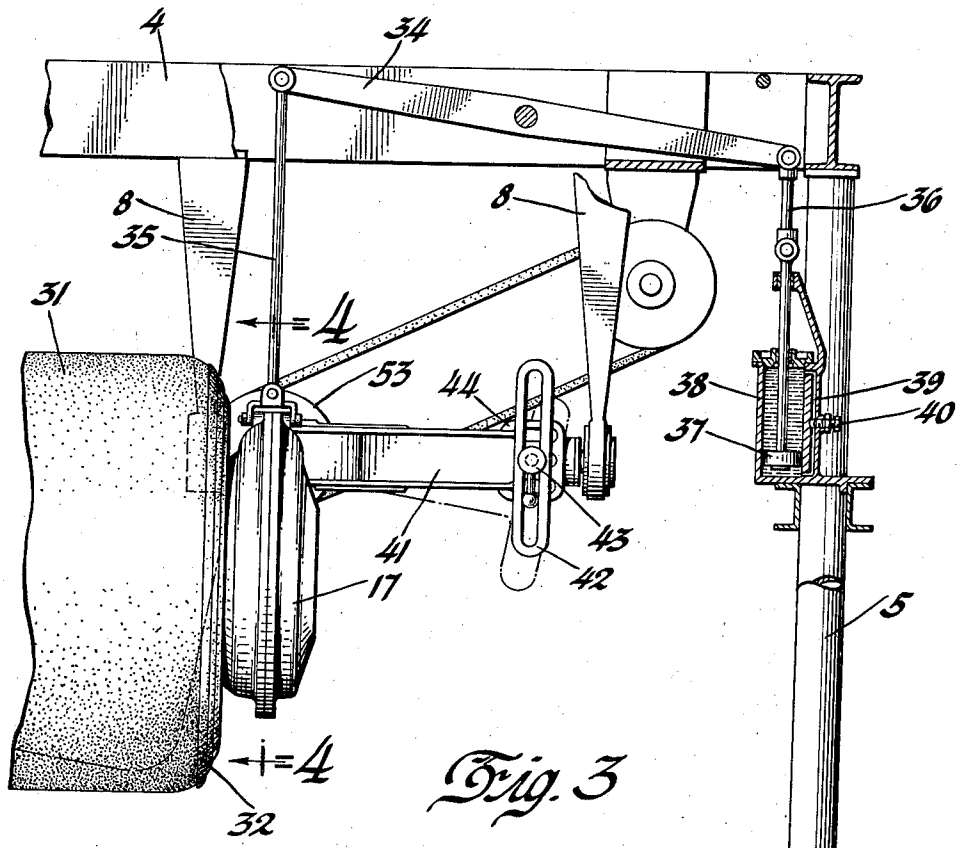

Fig. 3

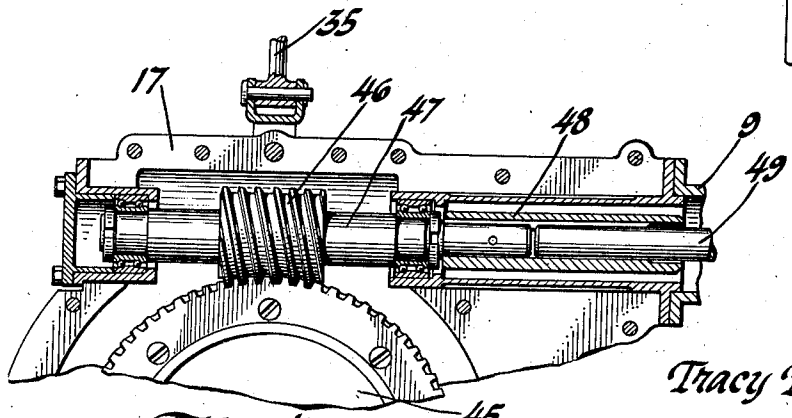

Fig. 4

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SANDING MACHINE

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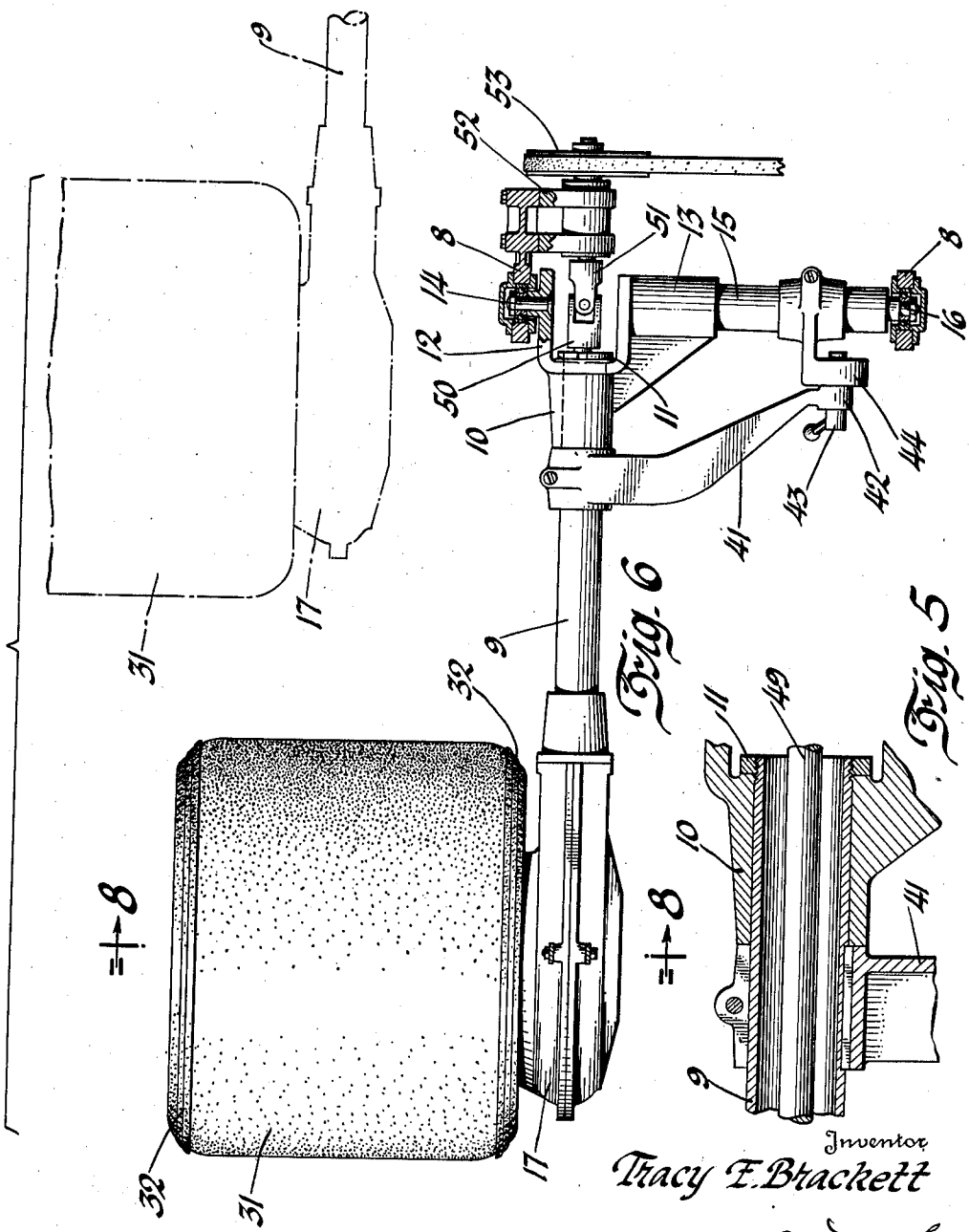

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SANDING MACHINE

Filed Oct. 30, 1936 5 Sheets-Sheet 5

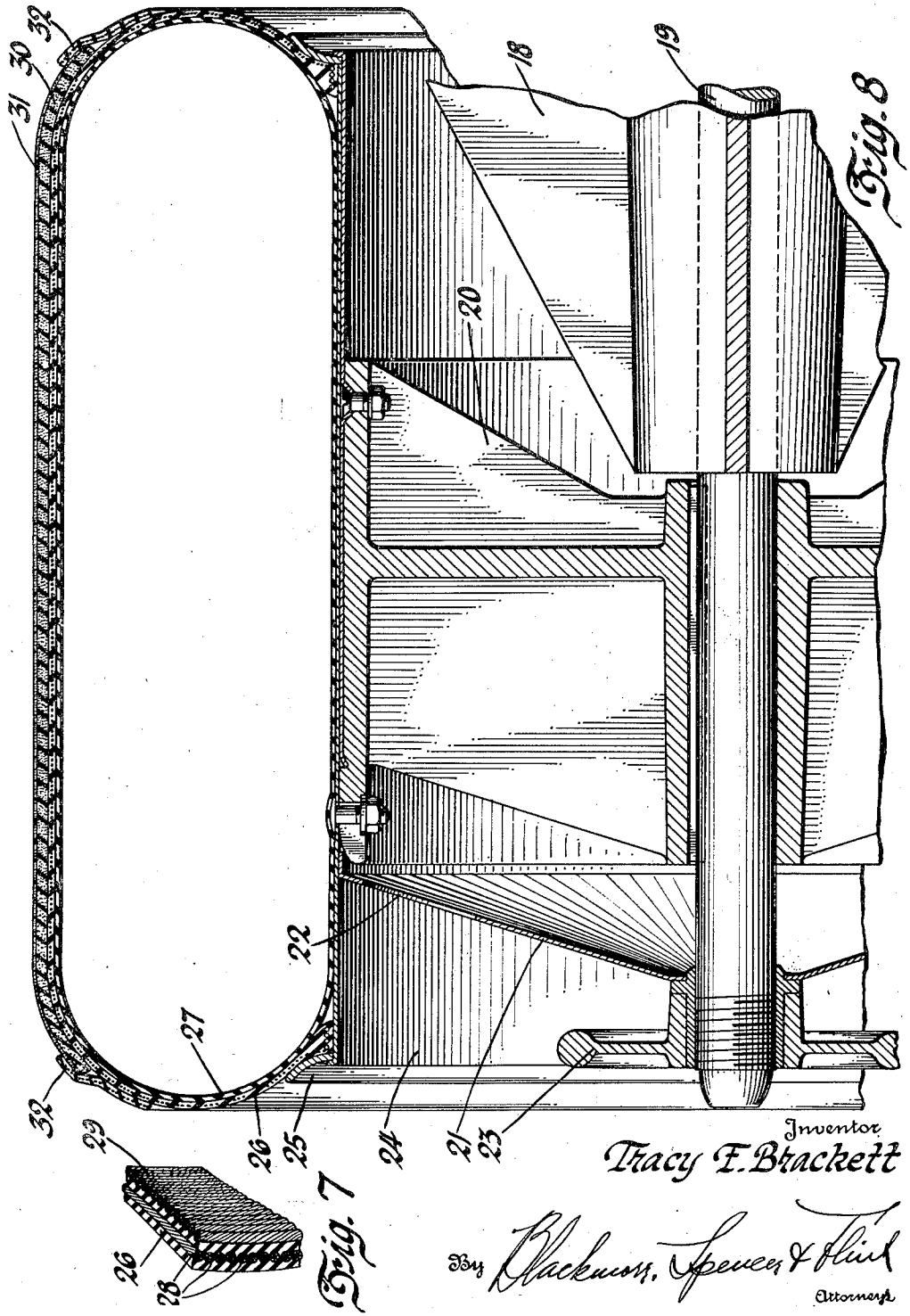

Fig. 8

Fig. 7

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UNITED STATES PATENT OFFICE

2,108,193

SANDING MACHINE

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Application October 30, 1936, Serial No. 108,350

9 Claims. (Cl. 51—74)

This invention relates to surface finishing of automobile bodies in the paint shop. It has to do particularly with a machine for sanding or polishing the metal roof of an automobile body as the body moves along on a traveling conveyor and is adaptable for either wet sanding or dry polishing operations.

According to the preferred embodiment herein disclosed the machine involves a supporting frame structure straddling the conveyor line and carrying a set of independently swinging lever arms in each of which is rotatably mounted a drum or roll surrounded by a band of abrasive paper or other finishing material. For wet sanding spray pipes direct copious quantities of water on the surface at each roll. The several rolls are arranged one behind the other in laterally offset relation to cover in short sections the whole width of the transversely curved roof panel. In addition the axes of succeeding rolls are angularly related so that the peripheral work engaging surfaces extend substantially tangent to the arcs being operated upon for approximately uniform contact across the roof.

The rolls are individually mounted on swinging lever arms and are movable up and down within limits to follow the rise and fall of the surface being operated upon, roof body contours generally being curved longitudinally. Because of the swinging lever arm suspension of the rolls the working pressure is afforded by the gravity load of the swinging assembly and the parts are designed and selected for weight according to the working pressure desired, which may be on the order of that exerted by the workman in the ordinary manual sanding.

With existing materials and methods of application it is deemed best to simulate hand sanding and in this connection a flat rather than line contact between the roll and body surface is provided by a cushion or yieldable backing for the sheet abrasive band. A satisfactory cushion consists of a low pressure air bag incorporated in the roll and inflated to three or four pounds. In general it resembles an automobile tire with an inner tube and an outer casing, except that its peripheral wall is flat rather than circular in section, because the stiffening cords instead of being cut on the bias extend circumferentially as to some and transversely as to others and, therefore, control distention of the casing to insure a flat outer face entirely across the width of the inflatable casing. This together with the tendency for the flexible wall to flatten circumferentially under pressure against the work affords a large area of contact of the abrasive sheet with the work surface.

The structure will be understood better upon reference to the accompanying drawings wherein Figure 1 is a side elevation with parts broken away of the assembled machine; Figure 2 is a view looking in the direction of the arrows on line 2—2 of Figure 1; Figure 3 is an enlarged fragmentary view showing the lever arm suspension for one of the rolls; Figure 4 is a detail sectional view taken on line 4—4 of Figure 3; Figure 5 is a detail section illustrating the swivel mounting of the lever arm; Figure 6 is a plan view with parts in section of a lever arm assembly; Figure 7 is a detail sectional view showing in perspective a portion of the outer casing and Figure 8 is a sectional view taken on line 8—8 of Figure 6.

In the drawings there is indicated by broken lines the outline of an automobile body, the roof panel of which is to be sanded. The body is indicated by the numeral 1 and it will be noted that the roof is curved in all directions, the longitudinal curvature being shown in Figure 1 and the transverse curvature in Figure 2. The body is supported upon the usual dolly 2 adapted for suitable connection with a conveyor chain 3 by which a succession of the bodies are moved in a given path through the shop and past the several stations where various operations are performed. According to the present invention it is proposed to sand the roof of the body as the body moves along on the conveyor line and to perform this operation automatically and without the presence of an attendant.

While the machine has been particularly designed and will be hereinafter described, for smoothing the roof surface of an automobile body, the principles involved may be embodied in similar machines for smoothing vertical surfaces and the surfaces of articles other than automobile bodies.

In the present instance the supporting framework rests upon the floor in straddling relation to the conveyor line and includes a series of overhead beams 4 supported at each corner by vertical legs 5 which rest on longitudinal side beams 6. Each of the lower beams 6 has a pair of adjustable screw studs or jacks 7 engageable with the floor for varying the height of the superstructure to meet conditions of use. Secured to the cross bars 4 in suitable spaced relation are a series of dependent hangers 8 arranged in pairs, each pair being adapted to support a swinging lever arm by which a rotary sanding drum is suspended in the

line of travel of the surface to be operated upon. As seen in Figures 5 and 6 each lever arm includes a tube 9 one end of which is journaled for rocking adjustment about an axis extending longitudinally thereof within a sleeve 10, the tube being held within the sleeve by a nut 11 threaded on the end thereof and bearing against an end face of the sleeve 10. The sleeve in turn has a pair of extensions or forks 12 and 13, the extension 12 terminating in a trunnion stud 14 pivotally mounted in one of the hangers 8 while the other fork 13 terminates in an enlarged eye fitted to a spacer tube 15 which in turn terminates in a trunnion 16 pivotally mounted in the adjacent hanger 8. The trunnions 14 and 16 are arranged in transverse alinement and provide a pivotal axis about which the lever has relatively free swinging movement. The opposite end of the lever 9 carries an enlarged sectional housing 17 in a lateral extension 18 of which is rotatably mounted the drive shaft 19 for the rotatable work engaging roll. (See Figure 8.)

The roll includes a spoked wheel 20 keyed at its hub to the shaft 19. A cover plate 21 having ventilating holes 22 conceals the wheel 20 and is fastened to the end of the drive shaft 19 by a removable hand nut 23. Secured in suitable fashion to the rim of the wheel 20 is a sheet metal band 24 to which is removably secured by the bead engaging rings 25 the outer casing 26 of the cushion backing element. This rubber casing 26, which encloses an inflatable inner tube 27, provides a hollow annulus which as shown in Figure 8 is substantially oblong in section with its outer face extending in a straight line substantially entirely across the width thereof. To insure the flat profile and guard against the natural tendency of the inflated casing to assume a circular cross section, flexible stiffening cords are preferably embedded within the casing and such cords are arranged in two groups, one set 28 extending circumferentially and the other set 29 transversely of the annulus. The circumferential series of stiffening cords 28 in the outer wall are all of the same length and, therefore, limit the distention of the outer wall to the predetermined degree and the transverse series of cords 29 cooperate with the first mentioned set in reinforcing the casing wall to insure against distention away from the preformed shape as well as lateral deflection.

Vulcanized around the outer face of the casing is a layer 30 of relatively soft material, such as sponge rubber, on which is seated the sheet band 31 of abrasive material. This sheet 31 may consist of a wide strip of sandpaper or the like cut to proper length and glued end to end and then fitted to the drum prior to inflation. Upon inflation the abrasive band will be held against displacement by its frictional engagement with the soft rubber backing layer 30 and as an additional precaution in this respect its edges may be inserted under a pair of flexible side flaps 32, the inner ends of which are vulcanized or otherwise secured to the side walls of the casing 26. These flaps preferably have embedded therein suitable reinforcing means which impart resistance to centrifugal forces so that they remain in fairly firm clamped engagement with the opposite edges of the abrasive sheet 31.

The direction of rotation of the drum preferably is opposite to the direction of movement of the body. For example, as seen in Figure 1, if the body is assumed to move toward the left the direction of rotation of each drum will be counterclockwise. Spray pipes are shown at 33 for directing water onto the surface being treated. As will be obvious the drums under the weight of the swinging assembly will flatten out upon engagement with the roof surface because of the cushion backing afforded by the inflatable casing for the abrasive sheet so that a large area of sanding material is in engagement with the surface at all times just as is the case in the sanding of the bodies by hand. It will also be apparent that as the body moves into engagement with the roller the roller will first be lifted in accordance with the rise of the roof contour and will then drop in conformity to the fall of the roof as the body moves beyond the roller. This action is very well illustrated by the position of the several rollers on the curved surface as seen in Figure 1.

To limit the extent of swinging movement of the levers and also cushion sudden forces, the dashpot arrangement shown in Figure 3 may be employed. In this arrangement one end of a pivotally mounted bar 34 is connected by a link 35 to the housing 17 and the other end is connected by a link 36 to a sliding piston 37 enclosed within a liquid chamber 38, the opposite ends of which communicate through a passage 39, whose size is controlled by an adjustable plug 40 for retarding the rate of piston movement imparted to it through the linkage from the swinging lever assembly.

The several rollers spaced longitudinally from each other are also offset from each other transversely as seen in Figure 2 and are arranged on angularly related axes so that the working surface of each extends substantially tangentially to the arcuate surface being operated upon. A slight overlap of the rolls will insure a more uniform working across the width of the roof and compensate for the slightly lesser pressure exerted along the edges of the respective rollers. The angular relation of the roll axes is provided for by the swiveled mounting of each tubular element 9 in its sleeve 10. Adjusted position is effected and maintained by means of a lateral arm 41 clamped at one end about the tube 9 and provided at its opposite end with an elongated slotted head 42 through the slot of which extends a manually adjusted setscrew 43 threadably engaged with a bracket 44 clamped to the space tube 15 of the swinging arm.

For rotating the rolls each mounting shaft 19 is fixed to a gear 45 enclosed within the casing 17 and meshed with a worm 46 on a driven shaft 47 as seen in Figure 4. The shaft 47 has suitable bearing within the casing and terminates in a sleeve 48 which has splined engagement with a shaft section 49 extending through the hollow tube 9 and terminating in the fork 50 of a universal joint whose axis is alined with the trunnions 14 and 16. (See Figure 6.) By reason of this construction the drive is transmitted through the universal joint in all positions of the sanding drum. The other fork 51 of the universal joint is on a shaft which has a bearing in a bracket 52 fixedly mounted on one of the hangers 8 and the shaft carries a belt driven pulley 53. A series of belts and shafting of suitable design may be employed for the common drive of the several rolls from a single source of power, as for example, the electric motor indicated at 54 rigidly supported in the framework.

I claim:

1. In a surface finishing machine of the character described, a yieldable mounting for a work

engaging surface including an annular flexible container for fluid under pressure having incorporated in the wall thereof two sets of reinforcing cords, one set extending circumferentially and the other transversely thereof for limiting distention of the wall under fluid pressure to predetermined shape.

2. For backing a flexible surface finishing sheet, an inflatable annular bag and means confining distention of the bag under fluid pressure to present a flat backing face and comprising a series of circumferentially extending cords associated with the wall of the bag.

3. A resilient backing for a flexible surface finishing sheet which is adapted to conform to the work surface operated upon and includes a fluid pressure distensible annulus having a wall of elastic deformable material with flexible but non-stretchable circumferentially and transverse stiffeners embedded therein.

4. A rotary surface finishing device, including an annular inflatable support for a finishing surface having a flexible wall of oblong shape in section to provide a flat peripheral face and stiffening cords associated with said wall to maintain said oblong shape and arranged in circumferential and transverse sets.

5. A rotary surface finishing device including an inflatable annular casing adapted to be fitted on its periphery with a replaceable surface finishing band, a pair of transversely spaced flexible retainer flaps carried by and along opposite sides of the casing to retain against axial displacement a surface finishing band applied thereto, and stiffening cords associated with the flexible wall of the casing to impart to the peripheral portion, a flat face.

6. In a rotary surface finishing device, an annular cushioning backing for a replaceable surface finishing band and flexible flaps along opposite sides of the backing to receive the margins of an applied surface finishing band and resist axial displacement thereof.

7. In a device of the character described, a rotary drum to receive a work engaging band, said drum including, as a cushion support for the work engaging band, an annular hollow casing having a flexible wall, the periphery of which in section is flat across the width thereof, and stiffening cords embedded in the wall to control the shape thereof, said cords being arranged in two sets, one set running circumferentially and the other transversely of the casing.

8. In a sanding machine, a supporting frame, a swinging lever pivotally mounted on the frame, a sanding roll rotatably mounted on the lever, roll drive means mounted on the frame, and motion transmitting means between the drive means and the roll including a driving shaft carried by the frame, a driven shaft carried by the lever, and a universal joint connecting said shafts in alinement with the pivotal axis of the swinging lever.

9. Apparatus for sanding the longitudinally and transversely curved roof panels of automobile bodies, including a conveyor for continuously moving the bodies in a longitudinal direction, a series of transversely spaced longitudinally extending levers above the path of body movement, means pivotally mounting the levers on longitudinally spaced parallel transverse axes for vertical swinging movement, a series of rotatable sanding drums arranged in longitudinally spaced and laterally offset relation and means mounting the drums on the levers for vertical movement therewith about said transverse axes in conformity to the rise and fall of the longitudinally curved roof panel presented thereto in the movement of the body thereunder, and for rotation about angularly related transverse axes to present their working surfaces in tangential relation to adjacent transversely curved zones in the width of the roof panel.

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