

May 26, 1942.

T. F. BRACKETT

2,284,556

SANDING MACHINE

Original Filed Aug. 30, 1940

3 Sheets-Sheet 1

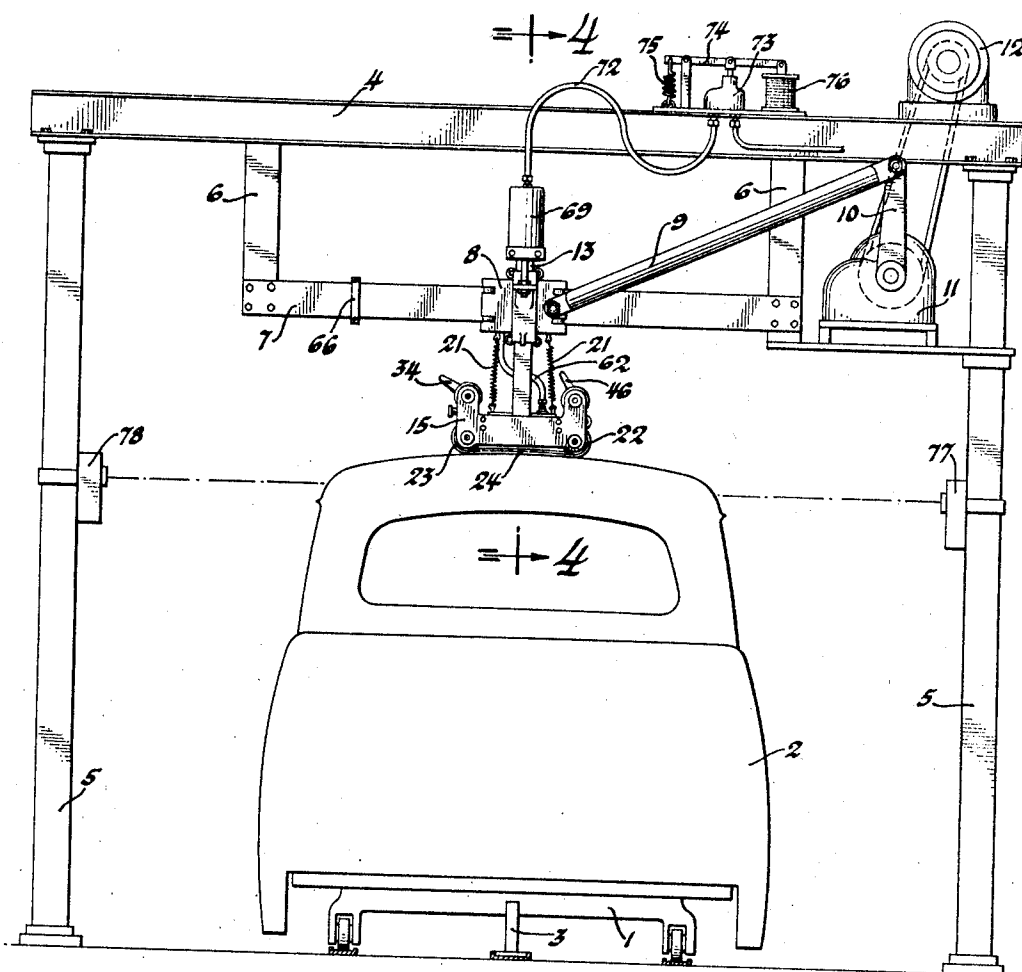


Fig. 1

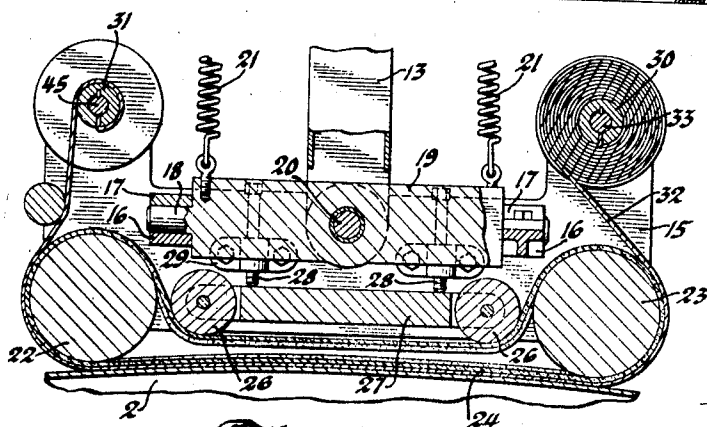


Fig. 3

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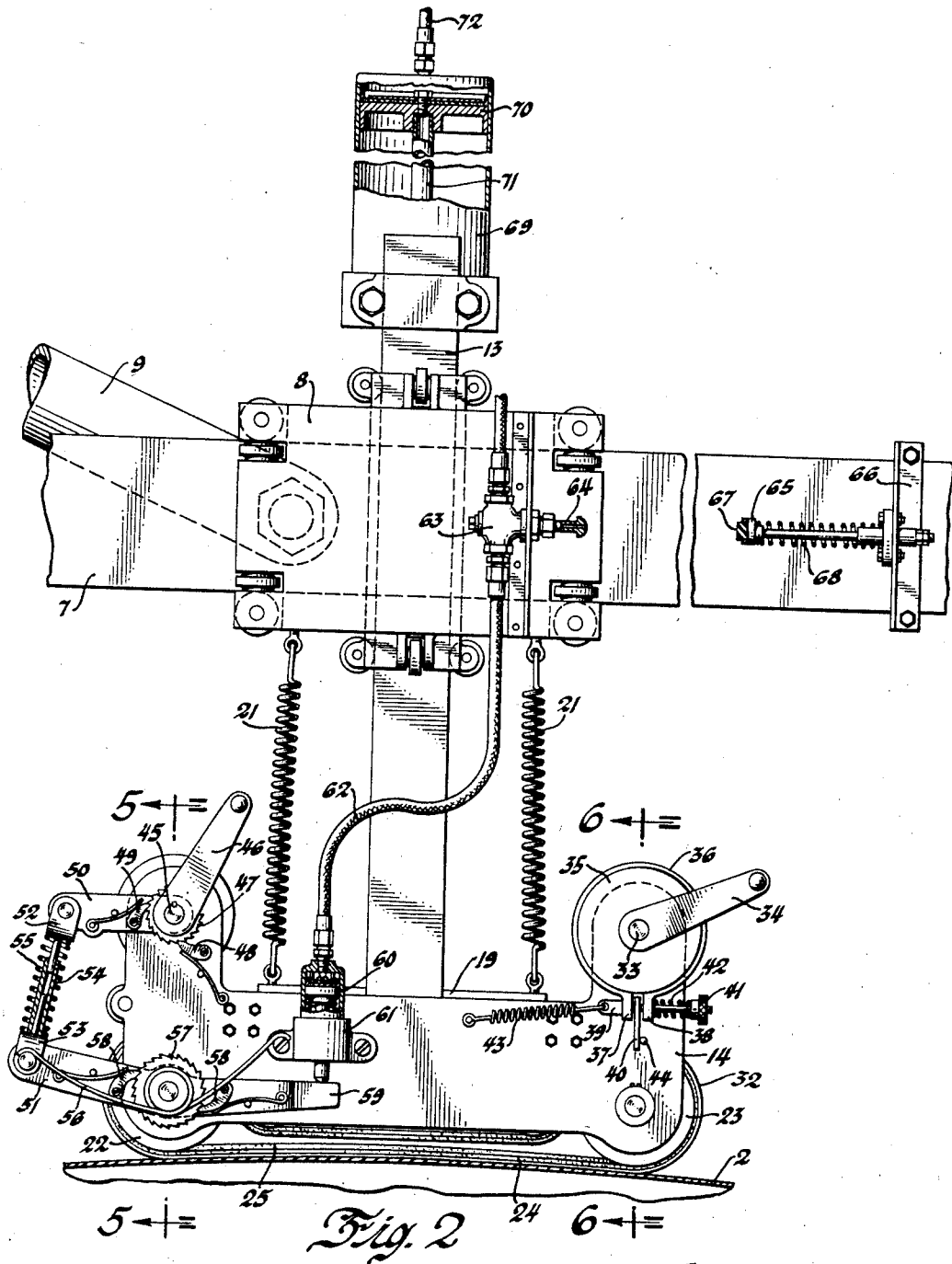
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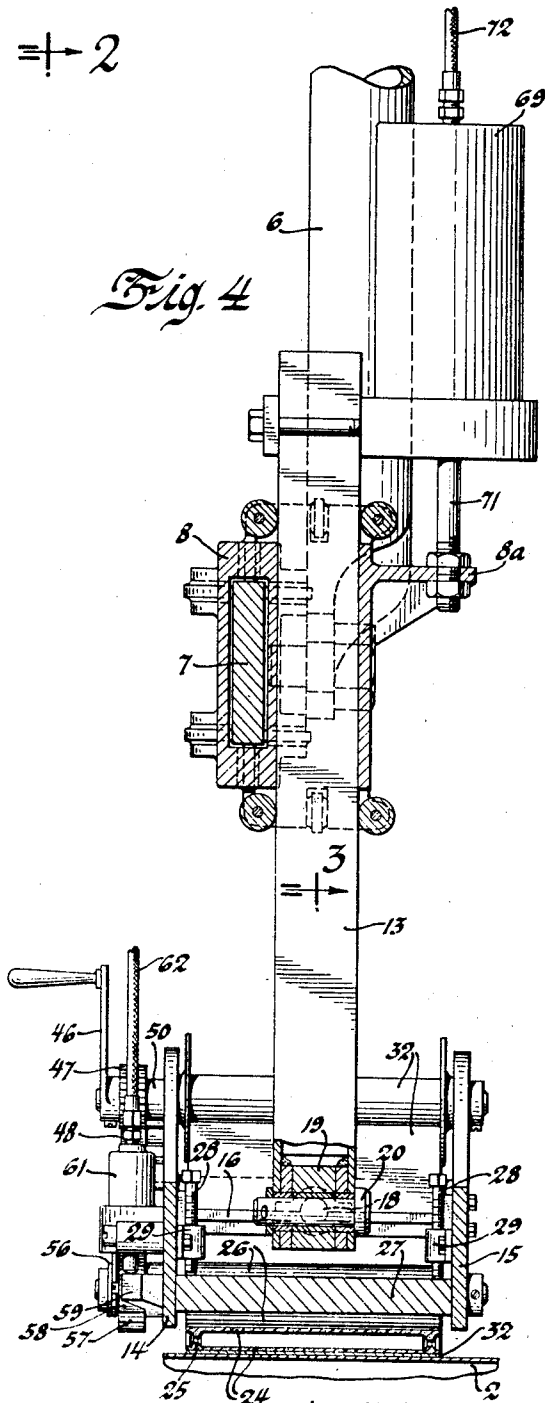
SANDING MACHINE

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3 Sheets-Sheet 3

$\Rightarrow \rightarrow 2$

Fig. 4



$\Rightarrow \rightarrow 2$

$\Rightarrow \rightarrow 3$

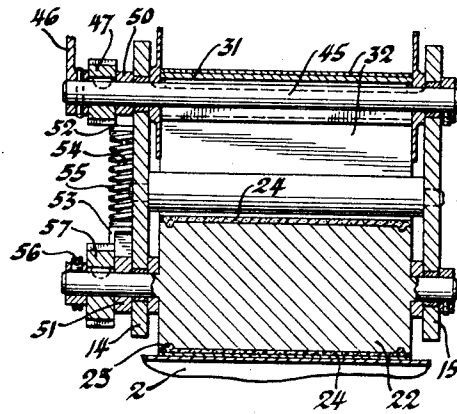


Fig. 5

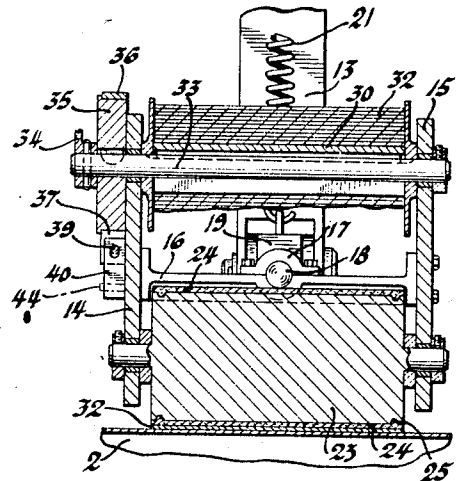


Fig. 6

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UNITED STATES PATENT OFFICE

2,284,556

SANDING MACHINE

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Original application August 30, 1940, Serial No.
354,865, now Patent No. 2,258,733, dated Octo-
ber 14, 1941. Divided and this application
February 13, 1941, Serial No. 378,815

9 Claims. (Cl. 51—59)

This application is a division of my pending patent application Serial No. 354,865, filed August 30, 1940, which became Patent No. 2,258,733, Oct. 14, 1941.

This invention relates to the art of working 5
surfaces in preparation for the application of
finish coatings as well as the smoothing and pol-
ishing of the applied coating. In the painting
of automobile bodies for example, the metal sur-
face after being thoroughly cleaned is given a 10
priming and one or more finish coats the latter
being preceded by proper sanding operations and
followed by a final buffing or polishing operation
involving the use of suitable abrasive material.
When the smoothing operations are performed 15
by hand a great deal of time and effort is
consumed, with uniformity of result depending
upon individual care exercised by the workmen.
For better uniformity and improved working con-
ditions the smoothing operations should be per-
formed mechanically and the present invention
relates to apparatus for that purpose.

More particularly the apparatus is designed for
smoothing operations on metal roofs of automo-
bile bodies which present surfaces of compound
curvature both longitudinally and transversely
and is for use in body manufacturing establish-
ments employing conveyor systems by which the
bodies travel in following order at a constant
rate of speed through successive work perform-
ing stations. Accordingly conveyor line travel
figures in the relative movement of the sanding
head and the surface being operated upon with
additional relative movement occurring through
reciprocation of the sanding head and at a rate 25
timed to the speed of conveyor travel to insure
proper action on the entire surface. This en-
ables the presentation of a relatively small area
of abrasive in the working zone to follow better
the irregular curved roof surface. Conformity to
curvature is also insured by the use of a flexible
endless belt acting as backing for the abrasive
pad or facing and by mounting the sanding head
for vertical movement on the reciprocating car-
riage and through a gimbal or universal joint.

In connection with the mounting of the sand-
ing head for vertical movement to follow the rise
and fall of the roof surface, provision is also made
for retracting the head at the end of the sanding
operation on one body for subsequent projection
as the leading roof surface of the next body comes
into the working zone. The movement of the
head away from and toward the work surface
may be controlled automatically and is of espe-
cial importance if the roof surface recedes from 55

front to rear and through a wide range, as it
removes the head from the low position on the
trailing surface of a body passing therebeyond
out of the path of the leading roof surface of the
oncoming body.

As a flexible backing for the abrasive, use is
made of an endless belt passing over a pair of
spaced drums and which also serves by reason
of intermittent travel imparted to it, to renew
the abrasive or polishing surface. The renewal
is effected by employing an abrasive strip having
opposite ends secured to an unwinding roll con-
taining the supply of unused strip and to a wind-
ing roll for taking up dulled strip with the strip
portion between the rolls embracing a run of the
belt and by reason of tension imposed on both
ends thereon, clinging frictionally to the belt
so as to feed forward with belt travel. The pe-
riodic travel of the belt is in short but uniform
strokes as predetermined by the rate of wear
of the abrasive and with tension on the rolls,
the abrasive strip is fed forward at the rate of
belt travel irrespective of variations in roll di-
ameter. In compensation for the increasing di-
ameter of the winding roll in taking up dulled
abrasive strip fed forward in uniform lengths, lost
motion in the roll winding mechanism is intro-
duced through the use of a flexible motion trans-
mitting connection.

For a more detailed explanation reference will
be made to the accompanying drawings wherein
Figure 1 is an elevation of the complete assembly
viewed from the rear; Figure 2 is an enlarged
view viewed from the front as on line 2—2 of
Figure 4 and showing the sanding head mounted
on the reciprocating carriage; Figure 3 is a sec-
tional view of the sanding head taken on line
3—3 of Figure 4; Figure 4 shows the sanding
head and carriage in section as on line 4—4 of
Figure 1 and Figures 5 and 6 are detail sectional
views taken, respectively, on lines 5—5 and 6—6
of Figure 2.

While for the purpose of disclosure the inven-
tion is shown in its preferred embodiment as ap-
plied to roof surfaces of compound curvature it
will be understood that the mechanism will be
useful on flat or other types of surfaces and that
the abrasive used may be of any type ordinarily
employed for wet sanding, dry sanding or polish-
ing operations. For sanding operations, the
abrasive strip may consist of a length of sand-
paper of the desired width having its opposite
ends mounted on spools or drums so as to be fed
from one to the other. While not shown in the
drawing, the wet sanding will necessitate the use

of suitable spray heads for delivering water in proper quantity to the surface being operated upon.

As illustrated the work performing device is mounted overhead on a suitable framework above the conveyor line and is arranged to travel back and forth in a direction transverse to the longitudinal movement of the conveyor and additionally the head has a vertical movement transverse to both the direction of its reciprocation and the direction of conveyor travel to enable it to follow the rise and fall of the surface being operated upon.

In the drawings the reference numeral 1 indicates a conveyor truck or dolly supporting the body 2 and having a drag connection 3 with a continuously moving conveyor chain. Straddling the conveyor line is a framework consisting of one or more transverse beams 4 supported upon vertical posts 5—5. Suspended from the frame by dependent arms 6 is a transverse track or straight rail 7 on which is mounted a reciprocating carriage 8. To reduce friction the carriage is provided with a number of wheels or rollers to engage the several faces of the track bar 7 and motion is imparted to the carriage through a connecting rod or link 9 joined at one end to the carriage and at its opposite end to a rotating crank 10 forming a part of a gear reduction box 11 and being driven from an electric motor 12. For a conveyor line traveling at conventional speed the arrangement of the parts is such that carriage reciprocation is at a rate of about sixty strokes per minute.

Located within a guide opening in the carriage 8 and running against a number of antifriction rolls is a dependent bar or tube 13 which has the sanding head universally mounted in its lower end. The sanding head in the present instance includes a pair of spaced frame plates 14 and 15 fastened to a pair of spacers or tie straps 16, each having a central depression which cooperates with a removable cap 17 in providing a bearing for the transversely extending end pin 18 at each end of a cross piece or swivel block 19. Centrally of the cross piece 19 and through a bearing opening therein is located the longitudinal pivot pin 20 for connection with the guide rod 13. By reason of the transverse pivot pins 18 and longitudinal pivot pin 20 the sanding head may rock in any direction to conform to the surface being operated upon but in order to keep the head level when out of work engaging position a pair of tension springs 21—21 on opposite sides of the joint extend between the head and the carriage in balanced relation.

Mounted between and in suitable bearings on the plates are a pair of transversely spaced rotating drums 22 and 23 to receive the endless belt or band 24 which provides a flexible or curve conforming backing for the abrasive strip and also serves by reason of its intermittent travel to feed the strip into the working zone. Along each edge of the belt and formed as an integral part thereof is an inwardly extending rib 25 arranged to ride within correspondingly formed annular grooves in the rolls 22 and 23 to prevent creep and give added strength to the belt edges. For maintaining the belt under proper tension a pair of idler rollers 26—26 engage the upper run of the belt and are carried in the pressure plate 27 fitted between the side plates 14 and 15 and held in proper adjustment by a series of four set-screws 28 threadedly engaged in suitable brackets 29 carried by the side plates. Also carried by

the side plates are a pair of spaced rolls or spools 30 and 31 to which are secured the opposite ends of the sandpaper strip 32 having the portion between the rolls running under the belt and providing the work engaging facing.

The shaft 33 to which the spool 30 is keyed is rotatable in bearings in the side plates 14 and 15 and beyond the side plate 14 has fixed thereon an operating handle 34 and a brake drum 35. An external split clamping rim or brake band 36 embraces the peripheral surface of the drum 35 for frictional clutching engagement therewith. Its opposite ends terminate in a pair of laterally projecting ears or lugs 37 and 38 (see Figure 2) through which extends a headed stud 39 carrying a cocking lever 40 in the space between the lugs 37 and 38 and an adjustable hand nut 41 against which is seated one end of a coil spring 42 surrounding the stud 39 and bearing at its opposite end against the lug 38 so as to exert an adjustable contracting force on the split braking ring 36. Secured at one end to the head of the stud 39 and anchored at its opposite end to an adjacent side plate 14 is a tensioning coil spring 43 which serves through the frictional engagement of the brake drum and braking ring to resist unwinding of the supply spool 30 and thereby take up slack in the sandpaper passing around the feed belt and maintain constant tension on the paper. The force of the spring 43 is overcome when a forward pull on the paper is exerted by travel of the belt so that the brake band 36 is moved with the roll until the cocking lever 40 by reason of its engagement with a fixed abutment 44 becomes tilted and exerts a spreading or prying force on the lugs 37 and 38 to expand the ring against the compression of the spring 42 and allow the brake drum 35 to slip relative thereto. At the end of the forward feeding stroke of the belt the pull of the spring 43 restores the position of the parts and tends to wind up the roll 30 to again maintain operating tension on the sandpaper strip 32.

The winding roll 31 adjacent the pay-off end of the feed belt is keyed to a rotatable shaft 45 mounted in bearings in the side frame members 14 and 15 with an operating handle 46 at one end together with a ratchet wheel 47 keyed thereto. A spring pressed pawl 48 is carried by the frame to engage the teeth of the ratchet wheel 47 and prevent reverse rotation of the winding roll. The ratchet teeth are also engaged by a spring pressed pawl 49 carried by rocking lever 50 fulcrumed on the shaft 45 to afford a one-way clutch action to wind up the roll upon swinging movement of the lever 50.

The free end of the lever 50 is joined through a lost motion connection with one end of a rock lever 51 fulcrumed on the mounting pin or axle of the belt roll 22. The lost motion connection may consist of a clevis 52 pivoted to the arm 50 and a clevis 53 pivoted to the arm 51, each clevis head having a projecting pin fitted to a guide sleeve 54 and surrounded by a motion transmitting spring 55 seated at opposite ends on the clevis heads 52 and 53. Clockwise motion of the lever 50, as seen in Figure 2, will be transmitted through the coil spring 55 from the rock lever 51 while return motion of the parts will occur by reason of the interconnection of the sleeve 54 with the clevis pins. For this purpose at least one of the clevis pins should be slidable relative to the sleeve 54 within established limits and thereafter become locked for movement

with the sleeve. Return movement of the lever 51 is effected by the force of a wire spring 56 having one end bearing on the lever 51 and its other end bearing on a fixed stop on the frame and being located by an intermediate coil surrounding the hub of a toothed ratchet wheel 57 which is keyed to the belt feed roll 22. Forward motion to the roll 22 is imparted through the ratchet wheel 57 by a pair of diametrically opposite spring pressed pawls 58—58 carried by the rock lever 51.

The opposite end of the lever 51 is formed with the head 59 arranged to be engaged by the end of a piston plunger 60 contained within an air cylinder 61 mounted on the sanding head side plate 14. Air or other suitable fluid under pressure is fed from a pressure tank or other source to the cylinder 61 through a flexible hose 62 accommodating relative movement of the head and is controlled by a valve assembly 63 mounted on the reciprocating carriage. The valve operating stem indicated at 64 is hollow so as to vent the air cylinder 61 when the valve is seated and is arranged so that at one end of the limit of carriage stroke it comes into engagement with a bumper 65 to unseat the valve. The bumper consists of a headed stud slidably mounted in an adjustable attachment bracket 66 on the carriage rail 7 in proper position as determined by the length of carriage stroke. To cushion impact a rubber nose 67 is carried by the head of the stud 65 and a coil spring 68 is interposed between the head and the mounting bracket so as to yield slightly to sliding movement of the headed stud 65 when engaged forcibly by the valve plunger 64.

With each impulse given to the operating cylinder 60 as the carriage completes a reciprocating cycle, the lever 51 is rocked and through its one-way clutching engagement with the feed drum 22 imparts travel to the feed belt which carries with it a corresponding length of sandpaper. Each short stroke of the feed belt pulls a new portion of sand paper from the unwinding roll and simultaneously, the winding drum takes up a similar amount of dulled paper coming from the feed belt. The wind up of the roll 31 occurs by reason of the motion transmitted to it through the spring 55, the spring serving to maintain a tension on the paper at all times and to swing the lever 50 to a sufficient angle to take up all the paper fed forward regardless of the increasing diameter of the winding roll, all excess operating force being absorbed in compression of the spring so that there is a compensation for differences in roll diameter in relation to the fixed amount of paper fed forward. In any event the rate of feed is independent of roll diameter and is at the uniform rate of belt travel with the paper at all times being held under tension at both ends for a firm frictional engagement with the feeding belt.

It will be understood that the working pressure on the sandpaper amounts to the weight of the sanding head assembly and that any rise and fall of the curved work surface is followed by reason of gravity since the guide post 13 is free to slide vertically in the reciprocating carriage 8. Because the sanding head would tend to drop after the roof surface operated upon passes out of the sanding zone it is desirable that provision be made for retracting the sanding head in the interval between the travel of succeeding bodies out of and into the sanding zone. A suitable mechanism for this purpose,

as illustrated in the drawing, includes the connection to the upper end of the guide bar 13 of an air cylinder 69 in which is fitted a stationary piston 70 connected by a rod 71 to a bracket or extension 8a on the reciprocating carriage 8. Air under pressure fed to the upper end of the cylinder will, therefore, tend to raise the sanding head assembly upwardly out of the interference with the oncoming body and at the proper time relief of pressure will allow the sand head to be projected or dropped into engagement with the working surface. The supply of air under pressure is delivered through a flexible hose 72 under control of a suitable valve 73.

As will be seen in Figure 1 the operating connection for the valve includes a rock lever 74 holding the valve in closed or cylinder bleed position by means of a coil spring 75 and having a connection with an electromagnet 76 which on energization opens the valve 73 to connect the fluid pressure source with the actuating cylinder. The electrical circuit for the operating solenoid 76 may be controlled by a conventional switch responsive to the action of a light sensitive or photocell arrangement. As shown in the drawing a light receiving device 77 and its co-operating light projecting device 78 are mounted on the spaced supporting posts 5 so that the beam of light is projected across the path of bodies moving on the conveyor line. In this manner as long as a body travels through the work performing zone the projection of the light beam to the receiving device 77 is interrupted allowing descent of the sanding head into work engaging relation while at times when the beam is uninterrupted the sanding head is lifted to retracted position.

Optionally the photocell arrangement may be employed also for intermittent operation of the sanding head reciprocating mechanism. It should be mentioned that while only a single sanding head has been referred to as covering the entire roof area and as completing the sanding operation by itself, an alternative arrangement contemplated includes two or more heads operating either side by side on the same track or in tandem on individual guide tracks.

The machine is universal in character in the sense that it can be used without modification or change on roofs of coupe, sedan and other types of bodies for any size chassis and regardless of variations in roof contours with changing design trends.

I claim.

1. For surface treating a body while it is traveling on a conveyor line, a surface treating device adapted to traverse the traveling body surface, a support for the device arranged to shift the same toward and from the surface, a reciprocating carriage for the support, means to guide carriage reciprocation transversely of conveyor travel, a photoelectric cell responsive to the presence of a body in the work zone and actuating means controlled by said cell and connected with the support to shift the device toward the surface when a body is conveyed into the work zone and to retract the device as the body moves beyond the work zone.

2. For surface treating a body during its travel on a conveyor line, a surface treating device arranged to reciprocate across the body surface in a path transverse to the direction of conveyor travel a photoelectric cell responsive to the presence of a body in the work zone and power driven actuating mechanism connected with said

device and controlled by said photoelectric cell to project said device toward a body surface traversing its path of reciprocation and to retract the device away from its work plane in predetermined relation to the progress of the body through the path of reciprocation of said device.

3. For performing work on a longitudinally curved surface of a longitudinally moving body, a surface engaging work performing device movable transversely of the longitudinal body movement to follow the curvature of the surface presented in the working zone thereof, means to retract the device to inoperative position beyond its surface engaging working zone and a photocell control for said means acting automatically in accordance with the presence in said working zone of surface to be worked.

4. For performing work on a rearwardly receding surface of a body while the body is traveling forward, a work performing device arranged to project into the path of and to engage said traveling surface through a predetermined range of its recession, and photocell means responsive to the presence of a body in the work zone to control the position of the work performing device and active after travel of a body carries its surface beyond said range, to retract the device clear of interference to forward travel of the next succeeding body.

5. For surface treating a body during its travel on a conveyor line, a sanding head reciprocable transversely of the path of body travel, a light sensitive device arranged to receive a light beam projected across the path of body travel and means controlled by said device to project said head toward the body surface when the projection of the light beam is interrupted by body travel and to retract the head upon restoration of the light beam to said device.

6. For working the surface of a body while

the body is in transit, a surface working device, means to project and retract the device to and from surface engaging position and photocell control mechanism arranged in relation to the path of body travel for automatically actuating said projecting and retracting means.

7. Apparatus for sanding roofs of automobile bodies, including a conveyor carrying a succession of bodies for action thereon in sequence, an overhead sanding device arranged for engagement with the roof of an automobile body passing thereunder, means to elevate said device above roof engaging position, a photoelectric cell operatively connected with said means to control its action and a light beam source directed to said cell across the path of body travel.

8. Apparatus for sanding roofs of automobile bodies, including a conveyor carrying a succession of bodies for action thereon in sequence, an overhead sanding device movable into engagement with a roof passing thereunder, means including a photoelectric cell for automatically controlling the movement of said device by body position relative thereto, other means for imparting transverse reciprocation to said device and means operative as an incident to such reciprocation for periodically renewing the abrasive facing of said device.

9. Means to treat a surface of irregular contour on a body as the body travels on a conveyor system through the working zone including a surface treating member, a traveling conveyor member supporting the body and presenting its surface to the surface treating member in the travel through the work zone and an electric eye control system arranged to be actuated by passage of a body through a light beam for shifting one of said members toward the other to maintain the work treating member in predetermined operative relation to the work surface.

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