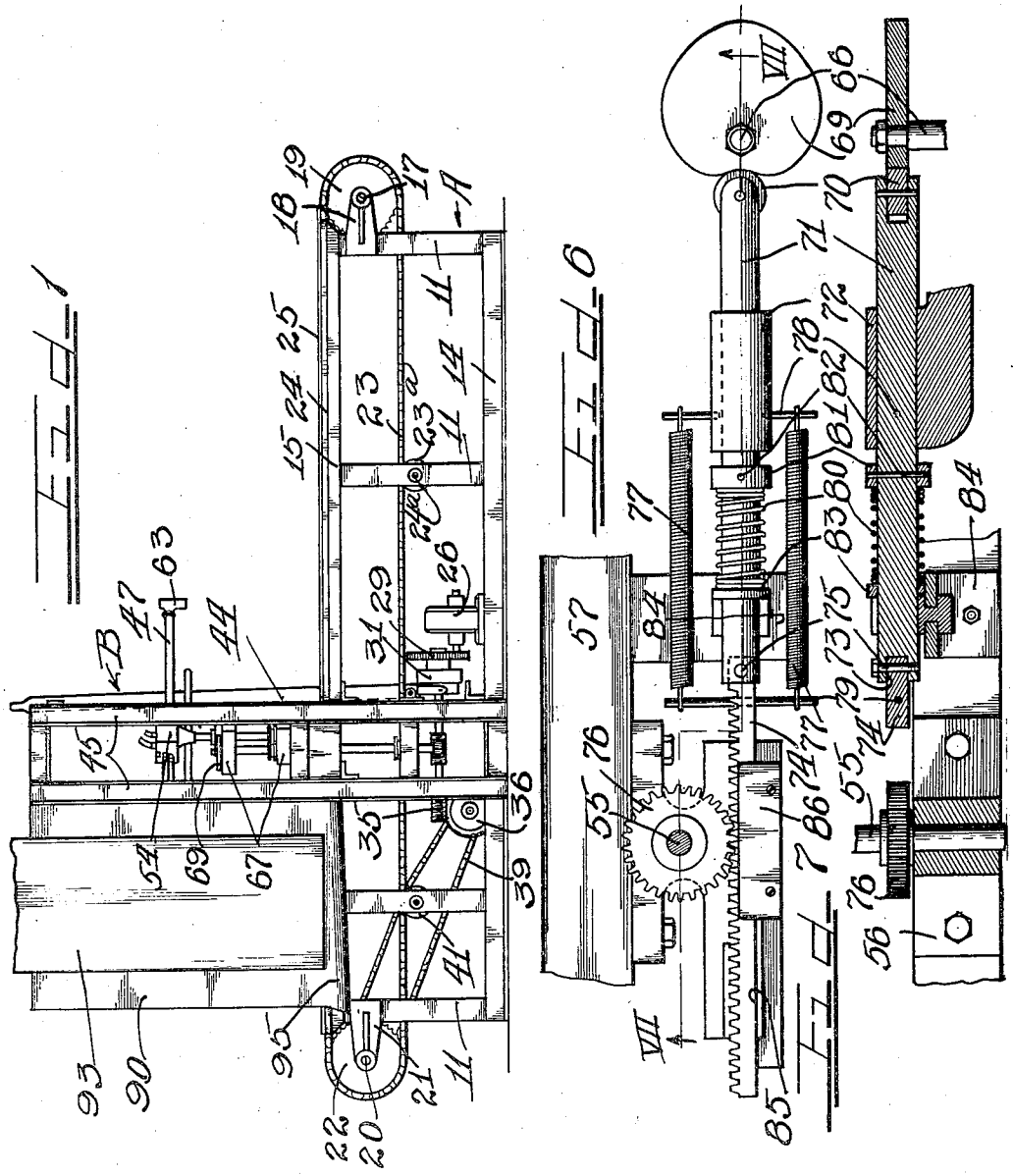
April 24, 1934. J. F. JOHNSON ET AL 1,956,220

METHOD OF FORMING BLACKBOARD SURFACES

Original Filed April 27, 1931 5 Sheets-Sheet 1



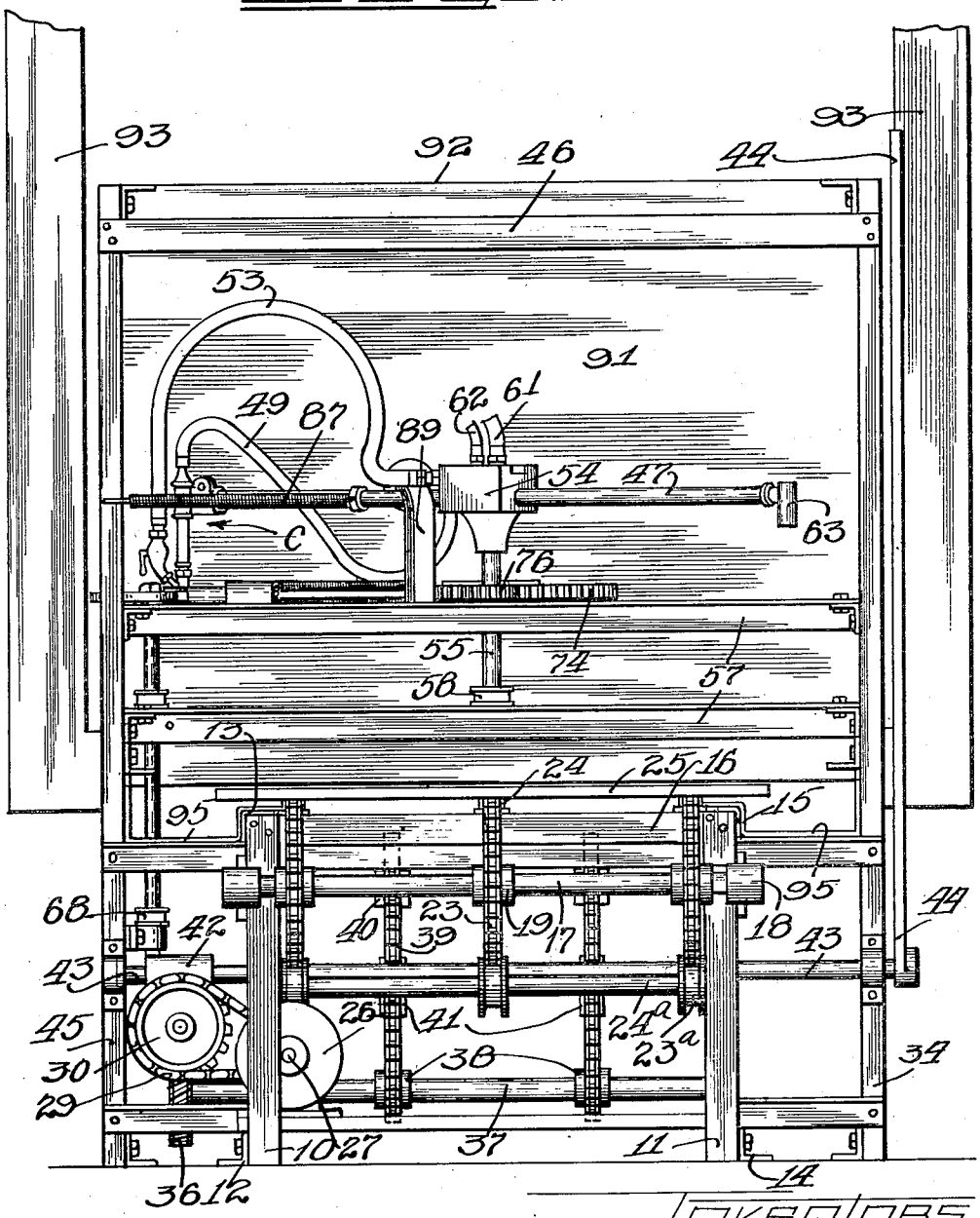
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METHOD OF FORMING BLACKBOARD SURFACES

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FIG. 2



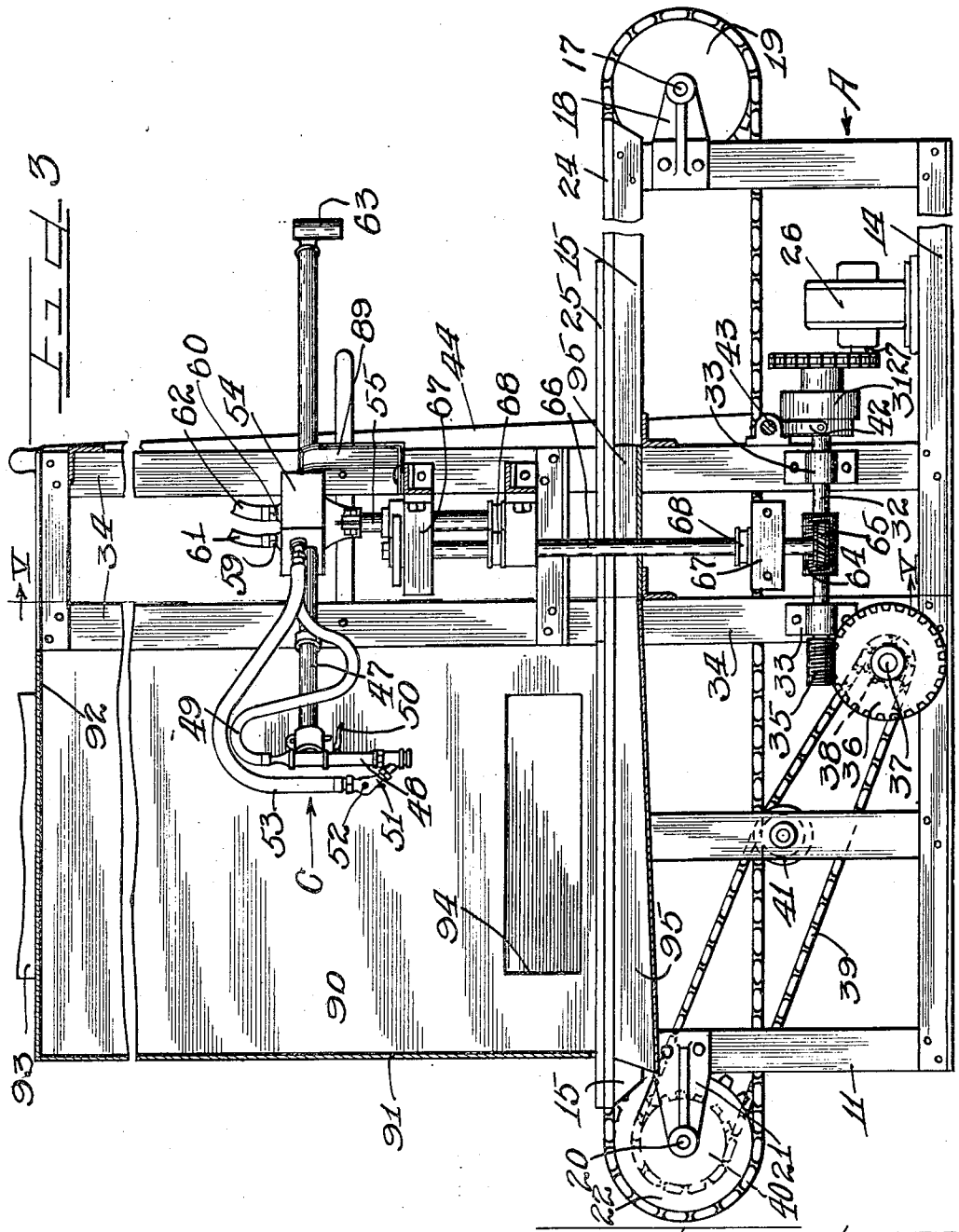
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METHOD OF FORMING BLACKBOARD SURFACES

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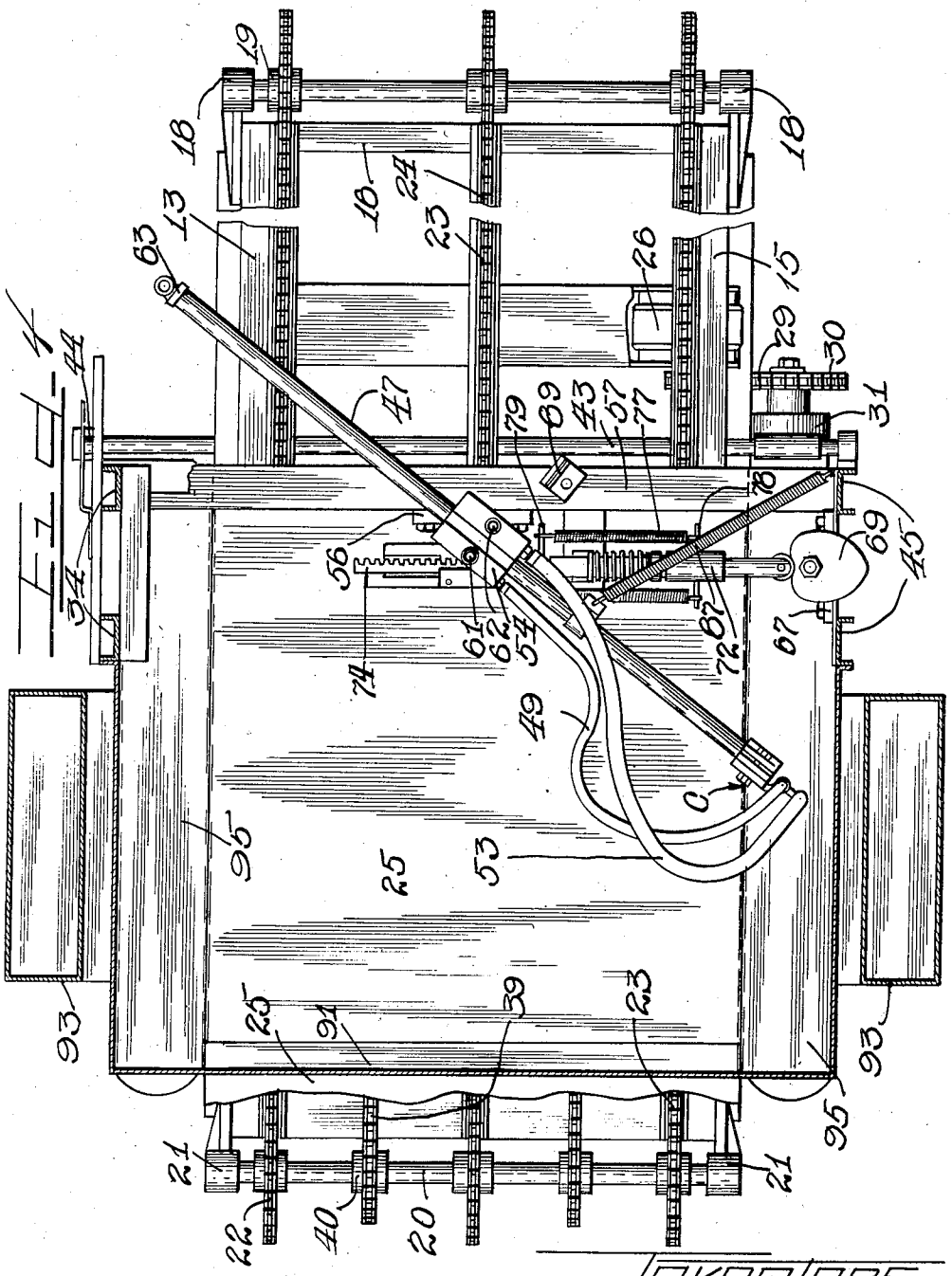
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METHOD OF FORMING BLACKBOARD SURFACES

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METHOD OF FORMING BLACKBOARD SURFACES

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Fig. 6

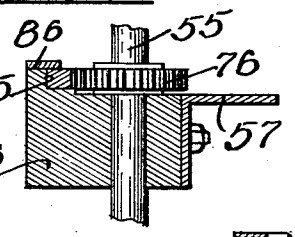
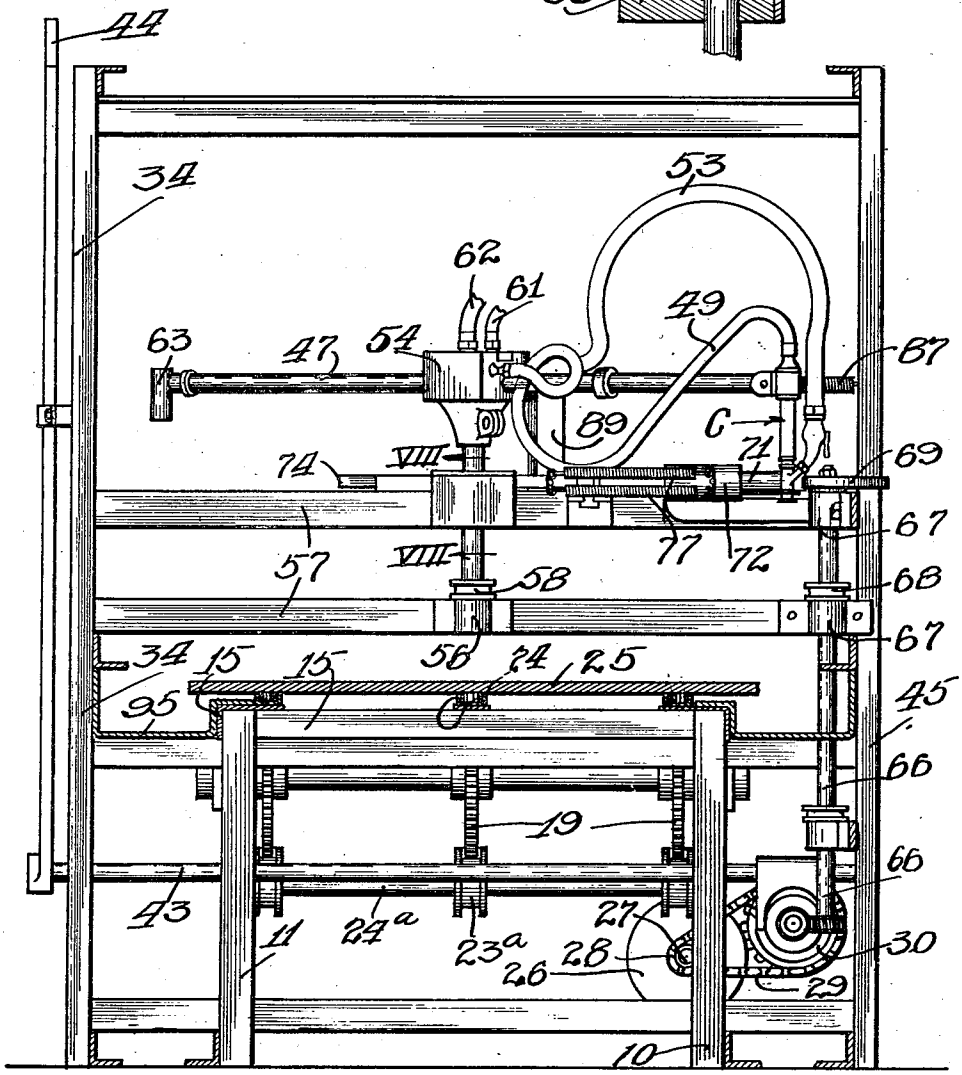


Fig. 5



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UNITED STATES PATENT OFFICE

1,956,220

METHOD OF FORMING BLACKBOARD SURFACES

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Original application April 27, 1931, Serial No. 533,196. Divided and this application October 19, 1932, Serial No. 638,456

1 Claim. (Cl. 91—68)

This invention relates in general to blackboards and is particularly concerned with an improved method for forming blackboard surfaces. The present invention is a division of our application Serial No. 533,196, filed April 27, 1931.

Heretofore, in the manufacture of blackboards, it has been the usual practice to provide a slab of material, which constitutes the body of the blackboard, and to apply a plurality of coats of various substances to the surface of this material to form the writing surface of the blackboard. These coatings of material have been applied in various ways among which were by means of a brush or by spraying the material onto the surface. Inasmuch as the various devices for applying the material were manually operated, the results obtained were unsatisfactory in that the coatings were usually uneven and not uniform. The surface was often streaked and was by no means pleasing to the eye.

In order to overcome the above and other objections to the present manner of manufacturing blackboards, it is an object of this invention to provide an improved method for depositing a uniform coating of material upon the surface of the body material of the blackboards.

Another object of this invention is to provide a novel method of coating blackboard surfaces wherein the fumes from the coating material will not pollute the surrounding atmosphere.

In accordance with the general features of our invention, we propose to provide a conveyor for carrying the blackboard along at a uniform rate of speed beneath a spray nozzle which is mounted in such manner as to be movable back and forth above the surface of the stock material at a uniform rate of speed. With this arrangement, the coating material will be deposited uniformly on the surface of the blackboard and the finished surface will be free from streaks and unevenness which were heretofore in evidence.

It is contemplated that a series of coatings of material will be applied to the surface of the slab of blackboard material. The underlying coats will be of a color composition and the last coat will contain an abrasive material such as carborundum.

Another feature of our invention is in the provision of an enclosure within which the spraying operation is carried on, this enclosure being provided with louvers or openings for the circulation of a stream of air which will carry off the fumes and thus prevent pollution of the surrounding atmosphere.

Other objects and features of this invention will more fully appear from the following detailed description taken in connection with the accompanying drawings which illustrate a single embodiment thereof, and in which

Figure 1 is an elevation of a machine embodying the features of our invention;

Figure 2 is an end elevation of the machine as viewed from the feed end of the conveyor;

Figure 3 is an enlarged side elevation in which the housing forming the spraying compartment is in section to show the ventilating opening in the side thereof and the details of the spraying mechanism;

Figure 4 is an enlarged plan view of the machine in which the housing forming the spraying compartments is in section to show the mechanism for oscillating the spray nozzle over the surface of the blackboard to be sprayed;

Figure 5 is a vertical transverse section of the machine, taken substantially on line V—V of Figure 3;

Figure 6 is an enlarged fragmentary view showing the details of the mechanism for oscillating the spray nozzle;

Figure 7 is an enlarged fragmentary sectional view of the mechanism for oscillating the spray nozzle, taken substantially on line VII—VII of Figure 6;

Figure 8 is an enlarged fragmentary section through the rack and pinion connection to the spray nozzle head, taken substantially on line VIII—VIII of Figure 5.

As disclosed in the drawings, the machine of our invention comprises in general a supporting frame structure, a conveyor, a spraying mechanism, and power means for actuating the conveyor and spraying mechanisms.

More specifically, the supporting structure for the conveyor mechanism consists of a frame A having spaced uprights 10 and 11, the uprights 10 being secured at their ends to lower and upper rails 12 and 13 respectively, and the uprights 11 to lower and upper rails 14 and 15 respectively, suitable cross bars 16 being provided in order to make the frame sufficiently rigid. A shaft 17 is rotatably supported in bearings 18—18 on the uprights 10 and 11 at one end of the frame A and has secured thereto at spaced intervals a plurality of sprocket wheels 19. A similar shaft 20 is rotatably supported at its ends in bearings 21—21 which are secured to the uprights 10 and 11 at the other end of frame A. Fixedly secured to and rotatable with the shaft 20 are a plurality of sprocket wheels 22 which are spaced apart so as

to be in alignment with the sprocket wheels 19 at the other end of frame A. A chain 23 is trained around each set of sprocket wheels, that is, each set consisting of a sprocket wheel 22 and a sprocket wheel 19, this chain extending over the upper surface of the frame A where it is confined within a channel shaped member 24 which extends longitudinally of and is supported upon the frame A. Each chain 23 passes over an idler pulley 23*a* on a tranversely extending shaft 24*a* which is supported on frame A so as to be adjustable to vary the tension of the chain. The chains 23 are of such thickness that they project above the walls of the channels 24 so that when a stock material, in this instance a slab of blackboard material 25, is placed thereon, it will be transported longitudinally of the frame A.

The conveyor mechanism is driven from a motor 26 which is supported on the lower rails of the frame A. The shaft 27 of this motor is provided with a driving pinion 28 which is connected by means of a chain 29 to a sprocket wheel 30 connected through a clutch 31 to a shaft 32. The shaft 32 is rotatably supported in bearings 33—33 on the spaced uprights 34—34. This shaft has secured therto at one end a worm 35 which meshes with a worm wheel 36 on the shaft 37 which extends transversely of the frame A and is supported thereon for rotation by suitable bearings. The shaft 37 carries a plurality of sprocket wheels 38 which are spaced at intervals therealong and are connected through chains 39 to a corresponding number of sprocket wheels 40 on the shaft 20, each chain 39 being trained over an idler 41 which is adjustable for varying the tension of the chain.

The clutch 31 which is of a type well known in the art is actuated by a shifting fork 42 on a rocker shaft 43 extending transversely of the frame A. This rocker shaft is connected to a lever 44 by means of which the clutch mechanism may be actuated.

A supporting frame B for the spraying mechanism extends above the frame A and at right angles thereto and is formed by the upright members 34 and similar upright members 45 which are outwardly spaced on either side of frame A and are interconnected by transverse bars 46 which provide sufficient rigidity.

The spraying mechanism comprises a spray nozzle C which is carried at one end of a pivotally mounted arm 47. This nozzle is of a type well known in the art and preferably consists of a tubular member 48 which is vertically disposed and to which a supply of air is connected by means of a hose 49. The air supply is controlled by a suitable valve which is actuated by a lever member 50. Connected to the member 48 adjacent the lower end thereof is an angularly disposed conduit 51 for injecting the material to be sprayed into the air stream passing through member 48. A valve 52 is provided in the member 51 for controlling the supply of spray material. The spray material is supplied through a hose 53 which is connected to the member 51.

The arm 47 is supported in a head 54 at the upper end of a vertically disposed shaft 55 which is rotatably supported in bearings 56—56 on transverse frame members 57—57 extending between and connected at their ends to the uprights 34 and 45. Disposed above and abutting the lower bearing 56 is a collar 58 which is secured to the shaft 55 for constraining the same against axial movement downwardly through the bearings.

The hose 49 and the hose 53 are connected to the head 54 which is provided with suitable connections 59 and 60 on the upper surface thereof, these connections being adapted for receiving hose connections 61 and 62, respectively, from the sources of supply for the air and the material to be sprayed. A handhold 63 is formed at the opposite end of the arm 47 from the nozzle C by means of which the arm may be shifted axially through the head 54 thereby permitting an adjustment of the arc of travel of the nozzle.

The spraying mechanism is driven from a worm 64 on the main driving shaft 32. The worm 64 meshes with a worm wheel 65 on the lower end of a vertically disposed shaft 66 which is rotatably supported in suitable bearings 67 and held against downward axial movement by collars 68 secured thereto and bearing against the upper surfaces of the respective bearings.

The upper end of the shaft 66 has secured thereto a horizontally disposed cam member 69 having its peripheral surface in engagement with a roller 70 at one end of a bar 71 which is mounted for axial movement in a guide member 72 secured to the frame B. The other end of the member 71 has a slot 73 for receiving an end of a rack 74, this rack being pivoted to the end of the member 71 by means of a bolt or pivot pin 75. The rack 74 meshes with a pinion 76 which is secured to the shaft 55.

The roller 70 is held in engagement with the peripheral surface of the cam 69 by means of springs 77 which are disposed on either side of the member 71 and extend parallel thereto, these springs being connected at one end to a bar 78 fixedly secured to the guide member 72, at their other end to a bar 79 which is secured to the rack 74. A coil spring 80 surrounds the member 71. One end of this spring bears against a collar 81 which is secured to the member 71 by a pin 82 and the other end of the spring bears against a stationary member 83 which loosely surrounds the member 71 and is supported on a bracket 84 in such a manner as to be laterally movable. The upper bearing 56 is grooved at its upper end as at 85 for receiving the rack 74 for reciprocable movement therein. The rack is retained in this groove by means of a plate 86, which extends over the upper surface of the rack where it passes through the groove.

The cam 69 is of such shape that when it is rotated rectilinear motion will be imparted to the rack, and the pinion 76 will be rotated so as to cause the arm 47 to oscillate back and forth and move the nozzle C at a uniform speed relative to the slab of blackboard material 25 which is being fed under the nozzle by means of the conveyor mechanism. By virtue of this rack and pinion connection, and since the cam 69 is provided with diametrically opposed dwell positions where the movement of the rack is reversed, a tension spring 87 is secured at one end to the arm 47 and at the other end to the upright members 45 for compensating for the lost motion in the driving mechanism. The spring 87 is assisted in this respect by a resilient stop member 89 which is mounted on one of the transverse members 57 so as to be engaged by the arm 47 at one end of its arcuate movement.

In order to prevent dissemination into the surrounding atmosphere of the spray discharge from the nozzle, a housing is provided which substantially encloses that portion of the machine where the spraying takes place. This housing comprises side members 90—90 which are secured at

one edge to the uprights 34 and 45. The back 91 of the housing may, if desired, be integrally formed with a top 92 or may consist of separate sheets which are welded, riveted or otherwise secured to the side members. The back 91 terminates at its lower edge adjacent the conveyor mechanism and is spaced above the same sufficiently to enable the slab of blackboard material on the conveyor to pass thereunder. This housing is open on the side toward the feed end of the conveyor to permit operation of the arm 47. A duct 93 is arranged at each side of the housing and communicates with the interior thereof through an opening 94 in the side member contiguous thereto. Each of these ducts is connected with a suction system so that the fumes arising from the spraying process will be carried away and not pollute the surrounding atmosphere.

Since the nozzle C is carried past the lateral edges of the blackboard which is being sprayed, and since the nozzle does not immediately start upon its return movement by virtue of the dwell positions in the cam 69 as previously described, lateral troughs 95 are arranged along each side of the conveyor beneath the lateral edges of the blackboard material to be sprayed. These troughs receive the material which is discharged from the spray nozzle during the time when it is at the dwell positions, the spray material deposited therein being thereby drained off into a suitable container and not wasted.

The operation of the machine of our invention is briefly as follows:

Having the clutch control lever 44 in the off-position the motor 26 is started by means of suitable control equipment. It is preferable at this time to have the nozzle C disposed over one of the troughs 95 in order to facilitate adjustment thereof without wasting the spray material. The spray is then turned on and properly adjusted by means of the valve 52 and the valve actuating member 50. A supply of slabs of blackboard material to be sprayed having previously been arranged on the conveyor system in end to end relationship, the machine is now ready to be started.

This is accomplished by moving the clutch control lever 44 to the running position. In this position the motor will drive the conveyor and carry the slabs of blackboard material under the spray at a uniform speed. Simultaneously with the movement of these slabs, the arm 47 will oscillate with a uniform speed and carry the nozzle C back and forth across the slab. This uniform movement of the arm 47 is effected by means of the rotation of the cam 69. Rotation of this cam causes the member 71 to reciprocate back and forth, and since this member is connected to the rack which engages the pinion 76, the rectilinear motion of the member 71 will be converted into rotary motion through the pinion. At the end of the arcuate movement of the arm 47, the arm will remain stationary for a short interval due to the diametrically opposed dwell positions formed in the cam surface. These dwell positions permit the slab blackboard material to be advanced a predetermined amount before the nozzle is again carried across the surface thereof. The continuous advancement of the blackboard slab and the movement of the nozzle back and forth thereover continues so long as the machine is running and these movements are so timed that the material sprayed on the surface of the blackboard will be uniformly and evenly distributed.

In using this machine in the manufacture of blackboards it is contemplated that several coatings of material will be applied to the surface of the slab of blackboard material, as for example, a number of coats of color composition and a final coat of material containing an abrasive element such as carborundum. It will be obvious that one machine may be used for the application of each successive coat or separate machines may, if desired, be used for applying each coat.

While we have illustrated in the drawings and described, in this instance, an embodiment of our invention which is particularly advantageous for use in forming blackboard surfaces, it is to be understood that in so doing, we do not contemplate limiting its use for this purpose only as it will be readily appreciated by those skilled in the art that our invention is with equal facility adapted for use in depositing materials on the surfaces of various and sundry articles.

Now, it is of course to be understood that although we have described in detail the preferred embodiment of our invention, the invention is not to be thus limited but only insofar as defined by the scope and spirit of the appended claim.

We claim as our invention:

The method of forming a blackboard which consists in causing a relative and uniform rate of movement of a slab of base material with respect to a liquid spray containing abrasive and being applied to a surface of the slab, and uniformly and transversely moving said spray across said slab to cover said surface of the slab with overlapping transverse strips of said liquid spray uniformly applied to the slab throughout its length and substantially free from the streaks and high spots usually incident to a manual coating of said surface.

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