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GRINDING, SMOOTHING, AND POLISHING APPARATUS

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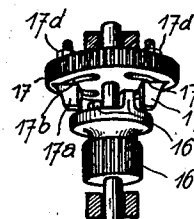
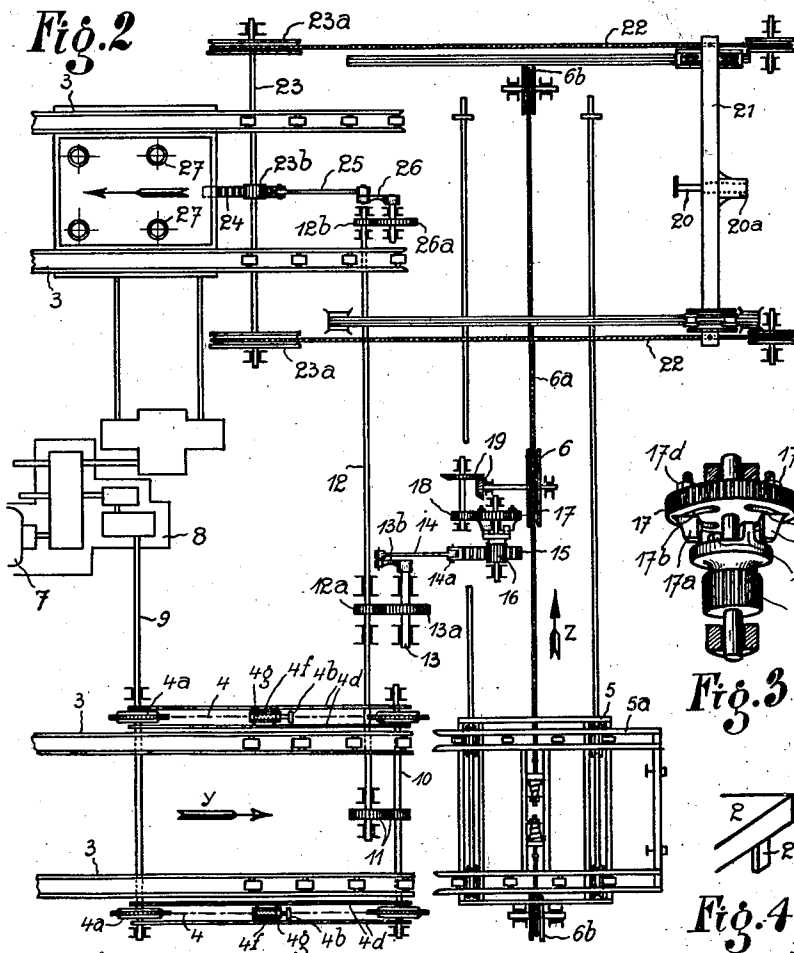
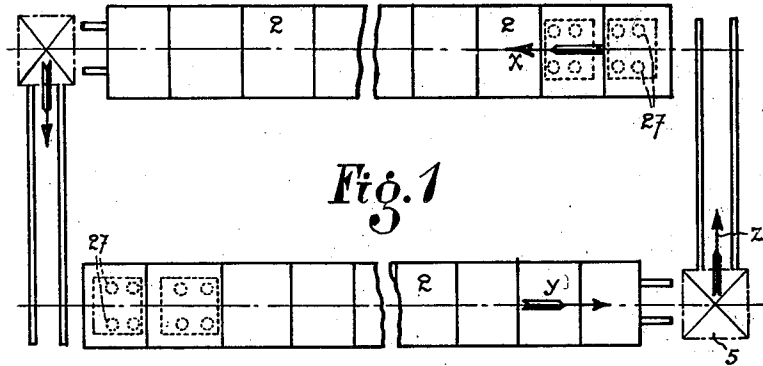


Fig. 3

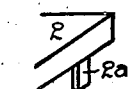


Fig. 4

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UNITED STATES PATENT OFFICE

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GRINDING, SMOOTHING, AND POLISHING APPARATUS

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The present invention relates to an apparatus for grinding, smoothing and polishing plate and sheet glass and other materials, in which these materials are carried by tables 5 which have a continuous movement beneath members which perform constantly the same work.

When it is a question of polishing raw glass, the distance covered by these tables before the plates of glass are finished, is considerable and may attain a length of about 250 meters. When the tables reach the end of their travel, one only of the faces of the glass is polished. To avoid having to send 15 back the table empty to the position where it entered the row, the invention proposes to arrange alongside of this row of tables a second row, so that the end of one row may be near the beginning of the other. These two 20 rows are preferably arranged in parallel. In order that the tables leaving one row may enter the adjoining row, the invention proposes a means of transferring the tables at the exit end of one row to the entrance end of 25 the adjoining row.

This object may be obtained for instance by arranging at the exit end of each row of tables, two pin chains driven at a higher speed than the movement of the tables in 30 the rows, and fitted with drivers which can thrust against lugs carried by the tables. Thus it is possible to detach the last table of each row and to pass it onto a transfer frame, which stops in front of the row in 35 question during the time necessary for placing the table in position.

The invention proposes that this transfer frame may have a reciprocating movement, and may be driven synchronously with the 40 forward motion of the tables, said transfer frame remaining stationary during an appreciable time at each end of its stroke. This movement of the transfer frame may be obtained for instance, by the use of a rod-and- 45 crank connection, in which the crank is driven continuously by the motor which produces the forward movement of the tables, while the connecting rod imparts a reciprocating movement to a rack which gears with a pin- 50 ion rigidly fixed to claws arranged between

other claws on a gear wheel, which communicates its motion to the driving gear of the transfer frame.

Besides this, the invention provides that the table carried by the transfer frame which 55 is momentarily stationed before the beginning of a row, may be pushed against the first table of this row by means of a device moving at a higher speed than the forward motion 60 of the tables in this row, said device being driven synchronously with the tables in the row, and being fitted with elastic members, of which the relatively large deflection is at least equal to the difference between the 65 distance covered by the tables in the row, and by the one introduced into this row during the time when the cross frame pushes the new table against the one which precedes it.

Other details and characteristics of the invention will become evident during the following 70 description of the accompanying drawings which represent diagrammatically one embodiment of the invention.

Fig. 1 is a plan view of an apparatus according to the invention. 75

Fig. 2 is a plan view on a larger scale, of the devices for transferring the tables from the exit end of one row to the entrance end of the adjoining row.

Figs. 3 and 4 represent details in perspective. 80

Fig. 1 shows tables 2 which are moved continuously, one row in the direction of the arrow X, the other row in the direction of the arrow Y. The two rows are arranged in 85 parallel to each other, so that the beginning of one of the rows is near the end of the other row and vice versa. Let it be assumed that the materials to be treated, for instance plates of glass, are first fastened on the left 90 hand table of the row moving in the direction of the arrow Y, and that on arriving at the right hand end one of their sides is polished, and a lifting apparatus lifts them off after they have been unfastened and turns them 95 over, preparatory to their being transferred to the other row X. In addition, the right hand table of the row Y is, according to the invention, transferred to the beginning of the row X. 100

This transfer may be effected for instance by means of devices shown more in detail in Fig. 2. It is there seen that on both sides of the guides 3 of the tables situated at the right hand end of the row moving in the direction of the arrow Y, there are fitted pin chains 4 driven by chain wheels 4^a at a higher speed than that of the tables. These pin chains are provided with drivers 4^b guided between bars 4^d and arranged to push against lugs 2^a (Fig. 4) fitted at the ends of the tables 2. Springs 4^e are interposed between the drivers 4^b and their carriers 4^e.

Thus when a table reaches the end of the row Y it is detached from the table which follows it, and pushed onto the frame 5^a of a transfer carriage 5 which may be subjected to a reciprocating movement in the direction of the arrow Z between the exit end of the row Y and the entrance end of the row X.

The pin chains 4, which may also be replaced by other equivalent devices, are driven by the same motor 7 which drives the transfer frame and produces the movement of the tables in the direction of the arrow X.

The motion of the transfer frame is obtained, for instance, by causing to turn first in one direction and then in the other, a pulley 6 on which a rope 6^a is rolled, said rope being attached to the transfer frame and passing round guide pulleys 6^b.

The reciprocating movement of this pulley 6 is effected by the motor 7 through a speed change box 8, a shaft 9, the pin chains 4, a cross-shaft 10 connecting them, pinions 11 connecting shaft 10 with a shaft 12, and pinions 12^a and 13^a which connect shaft 12 with a device for transforming a continuous rotary movement into a reciprocating movement, which will be described in detail further on.

In addition to its reciprocating movement, the transfer frame 5 must, at each end of its stroke, remain stationary a certain time so that during this time it may be loaded or unloaded with a table. These stops are obtained by keying on the shaft 13 carrying the pinion 13^a, a crank 13^b pivoted to a connecting rod 14 of which the end 14^a is pivoted to the end of a rack 15 gearing with a pinion 16 (Figs. 2 and 3) to which are rigidly attached claws 16^a arranged between other claws 17^a fixed to a gear wheel 17 gearing with a pinion 18 (Fig. 2) which drives the pulley 6 by means of the bevel pinions 19. By this arrangement, at each reversal of the direction of movement of the rack, the claws 16^a describe an angle equal to that which separates the claws 17^a, without touching one or the other of these claws with the result that during the whole time of this rotation, the gear wheel 17 remains at rest and therefore also the transfer frame 5.

This invention provides also for regulating the angular space between the claws 17^a,

so as to vary the duration of the stoppage of the transfer frame 5 at the two ends of its stroke. This regulation may be obtained, for example, by displacing the jaws 17^a in the slots 17^b and by locking them in the desired position by means of the nuts 17^d.

When the transfer frame 5 has arrived opposite the row X, the table which it carries is introduced into this row by the push of a buffer 20 carried by a cross bar 21 attached to cables 22 passing over pulleys 23^a which are subjected to an alternating rotary motion by causing a pinion 23^b on the shaft 23 of the pulleys 23^a, to gear with a rack 24 pivoted at the end of a connecting rod 25 driven by a crank 26 which receives a continuous rotary motion by means of the gears 26^a and 12^b, of which the latter is keyed on the shaft 12. The velocity of motion of the cross-bar 21 is greater than that of the tables of the row X, so that the table carried by the transfer frame may overtake the one included in the said row.

In addition, to deaden the shocks, the buffer 20 is fixed on the cross-bar 21 by means of a spring 20^a whose maximum deflection is sufficient to compensate the difference in the distances covered by the tables in the row and the one introduced into this row during the time when the cross-bar 21 pushes the new table against the one which precedes it. This spring 20^a further enables the new table to remain in contact with the preceding one during the time it takes said table to get into gear with the first pinions 27 which drive the row of tables.

The movement of the cross-bar 21, effected by the motor 7, is also synchronized with all the other movements to which the transferred table is subjected. This cross-bar, after having introduced a new table into the row X, returns to the position shown, while the transfer frame 5, which has likewise returned to the position shown, is reloaded with a new table and transports it to a position opposite the entrance end of the row X.

A device similar to the one shown in Fig. 2 is disposed at the left hand end of the rows X and Y of Fig. 1.

It is evident that this invention is not exclusively restricted to the structural embodiment illustrated, and that many alterations may be made in the shape, constitution and arrangement of its component members without exceeding the scope of the invention.

What I claim is:

1. In an apparatus for grinding, smoothing and polishing plate glass, sheet glass and other materials, including members always performing the same work, the combination of movable tables arranged one after the other, means for moving said tables in a continuous manner beneath said members, the said tables being grouped in two rows, arranged one near the other so that the end

of one row is near the beginning of the other, and means for transporting the tables leaving one row to the entrance of the neighbouring row; the said transporting means including a transfer frame and a device which delivers to said frame the table leaving one row of tables, at a higher speed than that of said row.

2. In an apparatus for grinding, smoothing and polishing plate glass, sheet glass and other materials, including members always performing the same work, the combination of movable tables arranged one after the other and provided with lugs, means for moving said tables in a continuous manner beneath said members, the said tables being grouped in two rows, arranged one near the other so that the end of one row is near the beginning of the other, and means for transporting the tables leaving one row to the entrance of the neighbouring row; the said transporting means including pin chains moving at a higher speed than that of the tables in the row, said pin chains carrying drivers arranged to catch the lugs carried by the tables.

3. In an apparatus for grinding, smoothing and polishing plate glass, sheet glass and other materials, including members always performing the same work; the combination of movable tables arranged one after the other and provided with lugs, means for moving said tables in a continuous manner beneath said members, the said tables being grouped in two rows, arranged one near the other so that the end of one row is near the beginning of the other, and means for transporting the tables leaving one row to the entrance of the neighbouring row; the said transporting means including pin chains moving at a higher speed than that of the tables in the row and carrying drivers arranged to catch the lugs carried by the tables, and elastic devices interposed between said lugs and drivers.

4. In an apparatus for grinding, smoothing and polishing plate glass, sheet glass and other materials, including members always performing the same work, the combination of movable tables arranged one after the other and provided with lugs, means for moving said tables in a continuous manner beneath said members, the said tables being grouped in two rows arranged one near the other so that the end of one row is near the beginning of the other, and means for transporting the tables leaving one row to the entrance of the neighbouring row; the said transporting means including pin chains moving at a higher speed than that of the tables in the row, drivers arranged to catch the lugs carried by the tables, carriers on said chains for said drivers, and interposed between the drivers and their carriers.

5. In an apparatus for grinding, smooth-

ing and polishing plate glass, sheet glass and other materials, including members always performing the same work, the combination of movable tables arranged one after the other and provided with lugs, means for moving said tables in a continuous manner beneath said members, the said tables being grouped in two rows arranged one near the other so that the end of one row is near the beginning of the other, and means for transporting the tables leaving one row to the entrance of the neighbouring row; the said transporting means including pin chains moving at a higher speed than that of the tables in the row and carrying drivers arranged to catch the lugs carried by the tables, said lugs being arranged at the rear ends of the tables.

6. In an apparatus for grinding, smoothing and polishing plate glass, sheet glass and other materials, including members always performing the same work, the combination of movable tables arranged one after the other, means for moving said tables in a continuous manner beneath said members, the said tables being grouped in two juxtaposed parallel rows so that the end of one row is near the beginning of the other, a transfer frame, means for displacing separately from a row to said transfer frame the tables leaving said row, and means for imparting a reciprocating motion to said transfer frame synchronously with the forward movement of the tables.

7. In an apparatus for grinding, smoothing and polishing plate glass, sheet glass and other materials, including members always performing the same work, the combination of movable tables arranged one after the other, means for moving said tables in a continuous manner beneath said members, the said tables being grouped in two juxtaposed parallel rows so that the end of one row is near the beginning of the other, a transfer frame, means for displacing separately from a row to said transfer frame the tables leaving a row, and means for imparting a reciprocating motion to said transfer frame synchronously with the forward movement of the tables, said transfer frame remaining motionless during an appreciable time at each end of its stroke.

8. In an apparatus for grinding, smoothing and polishing plate glass, sheet glass and other materials, including members always performing the same work, the combination of movable tables arranged one after the other, means for moving said tables in a continuous manner beneath said members, the said tables being grouped in two juxtaposed parallel rows so that the end of one row is near the beginning of the other, a transfer frame, members for driving it, means for displacing separately from a row to said transfer frame the tables leaving said row, a motor

for moving the tables forward, and means for imparting a reciprocating motion to said transfer frame synchronously with the forward movement of the tables; the last-named means including a reciprocating member, a rod and crank connection in which the crank is driven continuously by the motor and the connecting rod is connected to the reciprocating member, and a coupling which remains inactive during each time that said member changes the direction of motion interposed between the said member and the members which drive the transfer frame.

9. In an apparatus for grinding, smoothing and polishing plate glass, sheet glass and other materials, including members always performing the same work, the combination of movable tables arranged one after the other, means for moving said tables in a continuous manner beneath said members, the said tables being grouped in two juxtaposed parallel rows so that the end of one row is near the beginning of the other, a transfer frame, members for driving it, means for displacing separately from a row to said transfer frame the tables leaving said row, a motor for moving the tables forward, and means for imparting a reciprocating motion to said transfer frame synchronously with the forward movement of the tables; the last named means including a rack, a rod-and-crank connection in which the crank is driven continuously by the motor and the connecting rod is connected to the rack, a pinion gearing with said rack, jaws rigidly fixed to said pinion, a gear wheel operatively associated with the members which drive the transfer frame, and jaws carried by said gear wheel and between which the first-named jaws are arranged.

10. In an apparatus for grinding, smoothing and polishing plate glass, sheet glass and other materials, including members always performing the same work, the combination of movable tables arranged one after the other, means for moving said tables in a continuous manner beneath said members, the said tables being grouped in two juxtaposed parallel rows so that the end of one row is near the beginning of the other, a transfer frame, members for driving it, means for displacing separately from a row to said transfer frame the tables leaving said row, a motor for moving the tables forward, and means for imparting a reciprocating motion to said transfer frame synchronously with the forward movement of the tables; the last-named means including a rack, a rod-and-crank connection in which the crank is driven continuously by the motor and the connecting rod is connected to the rack, a pinion gearing with said rack, jaws rigidly fixed to said pinion, a gear wheel operatively associated with the members which drive the transfer frame jaws carried by said gear wheel and between which

the first-named jaws are arranged, and means to regulate the distance between the second-named jaws.

11. In an apparatus for grinding, smoothing and polishing plate glass, sheet glass and other materials, including members always performing the same work, the combination of movable tables arranged one after the other, means for moving said tables in a continuous manner beneath said members, the said tables being grouped in two rows arranged one near the other so that the end of one row is near the beginning of the other, and means for transporting the tables leaving one row to the entrance of the neighboring row; said transporting means including a device which moves the table about to enter into a row at a greater speed than that of the tables in said row.

12. In an apparatus for grinding, smoothing and polishing plate glass, sheet glass and other materials, including members always performing the same work, the combination of movable tables arranged one after the other, means for moving said tables in a continuous manner beneath said members, the said tables being grouped in two rows arranged one near the other so that the end of one row is near the beginning of the other, and means for transporting the tables leaving one row to the entrance of the neighbouring row; said transporting means including a cross-bar, and means for imparting a reciprocating motion to said cross-bar synchronously with the movement of the tables.

13. In an apparatus for grinding, smoothing and polishing plate glass, sheet glass and other materials, including members always performing the same work, the combination of movable tables arranged one after the other, means for moving said tables in a continuous manner beneath said members, the said tables being grouped in two rows arranged one near the other so that the end of one row is near the beginning of the other, and means for transporting the tables leaving one row to the entrance of the neighbouring row; said transporting means including a cross-bar, means for imparting a reciprocating motion to said cross-bar synchronously with the movement of the tables, buffers on the cross-bar, and elastic devices capable of a large maximum deflection between the buffers and the cross-bar.

14. In an apparatus for grinding, smoothing and polishing plate glass, sheet glass and other materials, including members always performing the same work, the combination of movable tables arranged one after the other, means for moving said tables in a continuous manner beneath said members, the said tables being grouped in two rows arranged one near the other, so that the end of one row is near the beginning of the other, and means for transporting the tables leaving

one row to the entrance of the neighbouring
row; said transporting means including a
cross-bar adapted to push a transferred table
against the one preceding it, means for im-
parting a reciprocating motion to said cross-
bar synchronously with the movement of the
tables, and springs associated with the cross-
bar and having a maximum possible deflec-
tion equal at least to the difference between
the distances covered by the tables in a row
and the one transferred into said row, during
the time when the cross-bar is pushing the
said transferred table against the one which
precedes it.

In testimony whereof I affix my signature.
SÉRAPHIN WEROTTE.

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