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R. REYNOLDS

PIANO PLAYER MUSIC AND MACHINE FOR PRODUCING SAME

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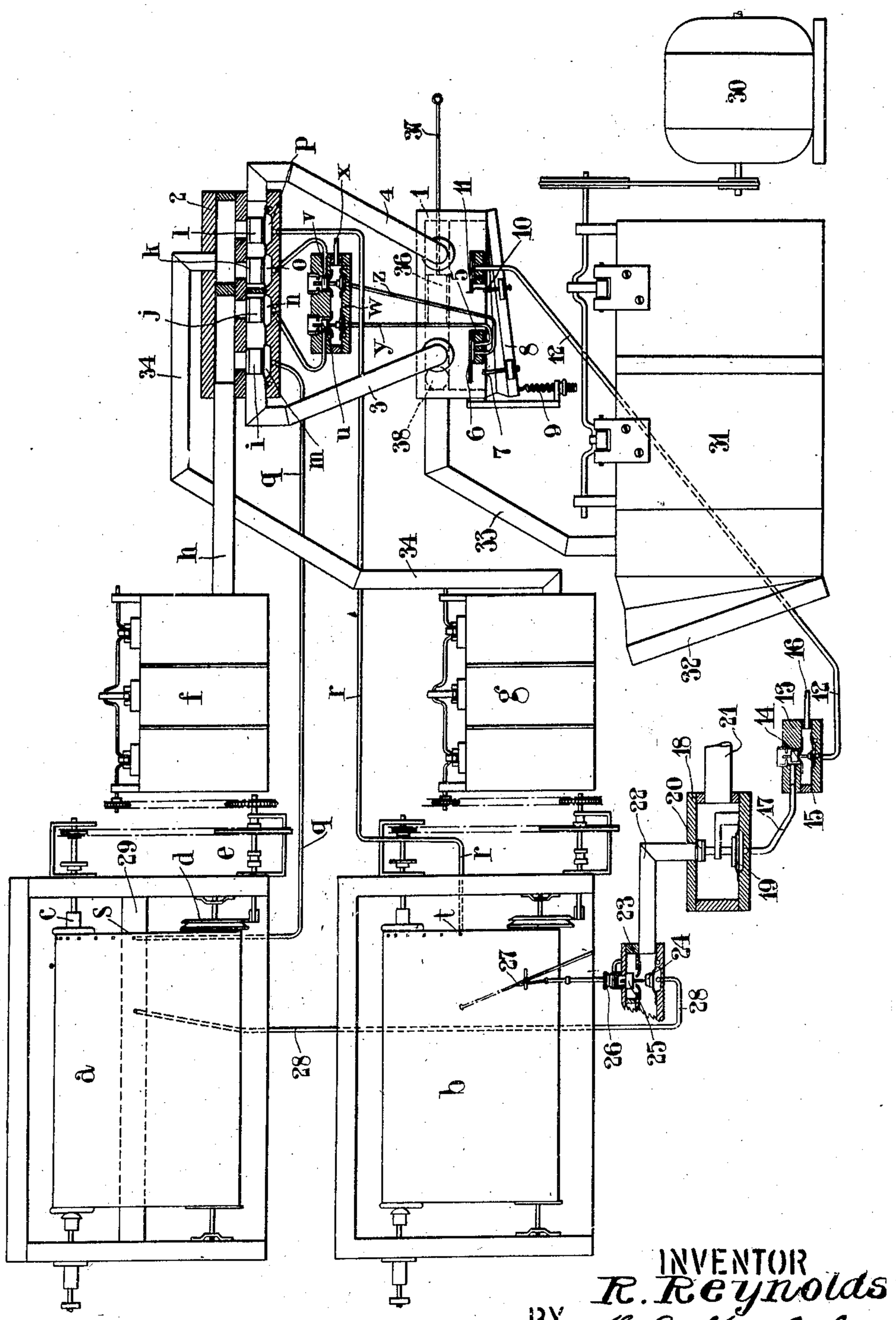

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PIANO-PLAYER MUSIC AND MACHINE FOR PRODUCING SAME.

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(GRANTED UNDER THE PROVISIONS OF THE ACT OF MARCH 3, 1921, 41 STAT. L., 1313.)

To all whom it may concern:

Be it known that I, REGINALD REYNOLDS, A. G. S. M., a subject of the King of Great Britain and Ireland, and residing at 34, The Crescent, Barnes, London, S. W., England, have invented certain new and useful Improvements Relating to Piano-Player Music and Machines for Producing Same (for which I have filed an application in England Oct. 31, 1918, Patent No. 134,324), of which the following is a specification.

This invention relates to improvements in music rolls hereinafter referred to as music sheets and their methods of manufacture. Music sheets as at present produced have usually a tempoline for the guidance of the operator in using the tempo lever. They also have an expression mark of an easily distinguished character for guidance as to the magnitude of the sound desired to be produced. These markings, even when applied at the same time, are usually placed on each music sheet individually, or in groups of sheets, say a dozen at a time, but their accuracy depends on the individual care taken in setting the individual sheets, and in controlling the marking devices, these operations being done by hand. It will be seen therefore that considerable differences will occur in different sheets of the same batch, while different batches will differ still further, and any real approximation to accuracy is precluded. This is believed to be one of the principal reasons why it has not hitherto been feasible to apply markings such as bar lines to roll music.

It has been proposed to provide a pneumatically actuated means for printing expression markings and a tempo line comprising a number of dots. By this proposal a master roll is furnished with certain series of perforations which control the action of the printing devices operating in connection with the music sheet, but since the drums upon which both the master roll and music sheet are fed forward are geared mechanically together, considerable inaccuracy in the positioning of the markings on the music sheet is liable to occur due say to the inequality between the natural strength in the paper forming the master roll and that forming the music sheet.

The objects of the invention therefore are to secure accuracy in the expression and other markings, and to enable bar lines and other markings to be applied accurately.

The invention consists in a piano player music sheet upon which markings are automatically placed in definite longitudinal positions relative to a series of marginal perforations in the music sheet.

The invention also consists in a marking machine including a marking roll and a music sheet the feed of each being independent and each provided with a series of marginal perforations adapted to effect synchronism of their movements.

The accompanying diagrammatic drawing illustrates one way of carrying the invention into effect.

In carrying the invention into effect in the form illustrated by way of example, I provide a music sheet *b* with a single series of marginal perforations *t* for the purpose of effecting accurate marking. This series I employ simply for the purpose of synchronising the movement of the music sheet *b* in the marking machine with the movement of the separate specially prepared marking roll *a*, which carries a number of series of marking perforations which are adapted to register with tracker bar ducts controlling marking mechanism, and in addition carries a single series of marginal perforations *s* adapted to effect the required synchronous movement in conjunction with the marginal synchronising perforations *t* on the music sheet *b*. Each series of perforations provided in the specially prepared marking roll *a* corresponds to a definite mark of expression which it is desired to imprint, say in typewritten characters, to the music sheet *b*. Only a single perforation of one of these series is however shown (at 35). The special marking roll *a* is unwound from an upper roller *c* on to a lower roller *d*, the two being suitably driven through gearing indicated at *e* operated from a pneumatic motor or other suitable moving device *f*.

The music sheet *b* can be similarly driven by a motor *g*.

The inlet to the motor *f* which governs its operation is connected by way of a pipe *h* to the valves *i*, *j*, resting on pneumatic cushions *m*, *n*, respectively. The cushions *m* and *p* lead by way of the pipes *q* and *r* to ducts in the tracker-bars corresponding to the marginal perforations *s* and *t* in the

roll *a* and music sheet *b*. The cushions *n* and *o* lead to the valves *u* and *v* in a supplementary valve chest *w* to which suction is applied by way of the pipe *x*.

The valves *u* and *v* rest on pneumatic cushions in connection with the pipes *y* and *z* leading to a motor controlled or bellows chamber 1 which is in communication with the chest 2 (carrying the primary valves *i* to *l*) by way of suction pipes 3 and 4. The pipes *y* and *z* terminate in a block 5 carrying a light spring controlled valve 6 adapted to be moved by a plunger 7 on the upward travel of a bellows plate 8 which is moved against the action of a controllable spring 9. The valve 6 on being raised by the plunger 7 permits air to enter pipes *y* and *z* and raise the valves *u* and *v* thus putting the cushions *n* and *o* in connection with suction pipe *x*. The valves *u* and *v* therefore when in the position shown in the drawing allow valves *j* and *k* to close and when in the raised position allow these valves to open by the deflation of cushions *n* and *o*. The governor I serves to regulate the speed at which the motors *f* and *g* operate since by variations of the tension of the spring 9 upon the bellows plate 8 the degree of suction required to raise the bellows plate 8 is varied. This plate 8 also carries a spring catch 10 which on being raised operates momentarily a cut out valve 11 and permits air to pass through a pipe 12 leading to pneumatic cushion 15 in connection with valve 14 in a valve chest 13. This valve 14 when occupying the position shown, puts the pipe 17 into communication with the atmosphere but when it is raised, it puts the pipe 17 into communication with the interior of valve chest 13 under suction through the pipe 16 and thus effects deflation of cushion 19 and dropping of the valve 20. The main suction chest 18 contains main suction pipe 21, and outlet 22 to a type operating valve chest 23 which has a pneumatic cushion 24, valve 25, operating means 26 for a typewriter mechanism 27 and a pipe 28 leading to an orifice 35 in a tracker bar 29 under the roll *a*. The pipes 16, 21 and *x* are in communication with the bellows chamber 31 by means not shown. Thus, the effect of raising the cut out valve 11 is to place the type operating valve chest 23 in communication with the main suction chest 18 which communication is cut off immediately the valve 11 again closes the pipe 12. It will be noted that the catch 10 operates the valve 11 before the plunger 7 has operated the valve 6; the object of this arrangement will be explained below.

Power is primarily applied to the apparatus from an electric motor 30 driving blowing feeders 31 controlling a reservoir 32 and is transmitted to the motor *g* by way of a pipe 33 leading to the motor control chest 1 thence to the primary valve chest and the pipe 34 and to the motor *f* by way of the primary valve chest and pipe *h*. A valve 36 is provided with an operating rod 37 enabling it to be moved to close the end 38 of the pipe 33 and so arrest the movement of both motors *f* and *g* when desired.

In operation a motor 30 is continuously running and suction is applied to the pipe 33 tending to lift the bellows plate 8 against the action of the spring 9. It is also applied by way of the pipe 3, valve *i* and pipe *h* to the motor *f* causing this to operate and to rotate the roll *a* until a perforation *s* comes over the end of the pipe *q*. That pipe is then open to atmosphere and the pipe 3 still being under reduced pressure, the pneumatic cushion *m* is distended, raising the valve *i* and closing the aperture above it. At the same time the cushion *n* is distended because the connection to the valve *u* is open to atmosphere, thus, both valves *i* and *j* being raised, the inlet to the motor *f* is closed and the motor stopped. Similarly the motor *g* is caused to rotate through suction applied by way of the pipe 34 until an aperture *t* in the roll *b* comes over the end of the pipe *r* when the motor *g* is stopped also. The stopping of the roll *a* and chest *b* is therefore determined definitely by the marginal perforations *s* and *t* respectively and is entirely independent of any unequal stretch in the paper comprising the marking roll and various music sheets. The tension of the spring 9 is so adjusted that it prevents the plate 8 being raised until a degree of suction resulting from stoppage of both motors is attained. Now as to the marking on the roll *b* corresponding to the marking on the roll *a*, both motors having stopped in synchronism by means of the perforations *s* and *t* as explained above, the plate 8 is raised and the catch 10 lifts the valve 11 momentarily thereby putting the valve chest 23 in communication with main suction pipe 21. No effect however, is produced upon the valve 25 unless an aperture in the roll *a* is at the time registering with an opening in the tracker bar 29. In the illustration, only one opening 35 is shown to which the pipe 28 communicates the other end of this pipe leading to the cushion 24 of type mechanism 27 but as explained above, a number of series of such openings, pipes and type mechanisms are employed according to the different markings required on the music sheet. Assuming a perforation in the roll *a* is registering with the opening 35 during the time the valve chest 23 is in communication with the pipe 21, then the cushion 24 is inflated and the operating means 26 momentarily is placed in communication with the main suction and will effect the typing of the necessary characters upon the music sheet. Further movement of the plate 8

causes the plunger 7 to lift the valve 6 and cause the valves *j* and *k* to drop and effect re-starting of both motors.

When electric operation of the marking machine is utilized the current may be made to depend on contact taking place together through both sets of perforations.

In some cases there are available margins of unperforated paper in existing music sheets and I may in some cases provide in these margins a number of series of perforations each corresponding to one of the required markings. In such cases the music sheet itself operates the stamping machine so constructed that the passage of each of these new marginal perforations shall pneumatically, mechanically or electrically cause a particular stamping or printing element instantly to come into contact with the paper of the music roll, thus printing, marking or perforating the desired indications of expression, and also the bar lines, in the precise relative position on the music roll to that in which they occur in the corresponding ordinary music. The series of marginal perforations are incorporated in the original master roll from which all the music rolls of the particular composition are reproduced, and thus uniform accuracy is attained in the marking of each music roll.

It will be appreciated that according to this invention the marking of each particular character takes place upon the music sheet always in a definite longitudinal position relative to the marginal perforation therein. The markings therefore are definitely located in relation to the variation in the rendering they are intended to indicate. The markings preferred are eight in number:—

1. "*p*"; 2. "*f*"; 3. "Rall."; *e*. "accel."; 5. "tempo"; 6. "⌢ (pause)"; 7. "∠ (account)"; and 8. a bar line.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. A marking machine for music player sheets, including a marking roll and a music sheet independent feeding means and a tracker bar for said music roll and for said music sheet, a series of marginal perforations in both roll and sheet, a duct in the tracker bar of said roll adapted to register successively with the individual marginal perforations in the marking roll and pneumatic means in connection with said duct adapted to arrest movement of the music sheet successively with its individual marginal perforations in register with a duct in the tracker bar of the said music sheet.

2. A marking machine for music player sheets, including a marking roll and a music sheet, tracker bars for said music roll and for said music sheet, means adapted independently to feed said music roll and said music sheet over their respective tracker bars, series of perforations in said music roll adapted to register with ducts in the tracker bar thereof, a series of marginal perforations in said music roll, the individual perforations of the latter being adapted to register with a duct in the music roll's tracker bar simultaneously with the registration of individual perforations of the first-named series of perforations with the first named tracker bar ducts, a series of marginal perforations in the music sheet, a corresponding tracker bar duct therefor and means for arresting both the music sheet and the music roll upon registration of the individual marginal perforations with their corresponding tracker bar ducts.

3. A marking machine for music player sheets, including a marking roll and a music sheet, tracker bars for said music roll and for said music sheet, means adapted independently to feed said music roll and said music sheet over their respective tracker bars, series of perforations in said music roll adapted to register with ducts in the tracker bar thereof, a series of marginal perforations in said music roll, the individual perforations of the latter being adapted to register with a duct in the music roll's tracker bar simultaneously with the registration of individual perforations of the first-named series of perforations with the first-named tracker bar ducts, a series of marginal perforations in the music sheet, a corresponding tracker bar duct therefor, means for arresting both the music sheet and the music roll upon registration of the individual marginal perforations with their corresponding tracker bar ducts, and means for appropriately marking said music sheet, said means being actuated upon registration of a perforation in the music roll with its corresponding tracker bar duct.

REGINALD REYNOLDS.