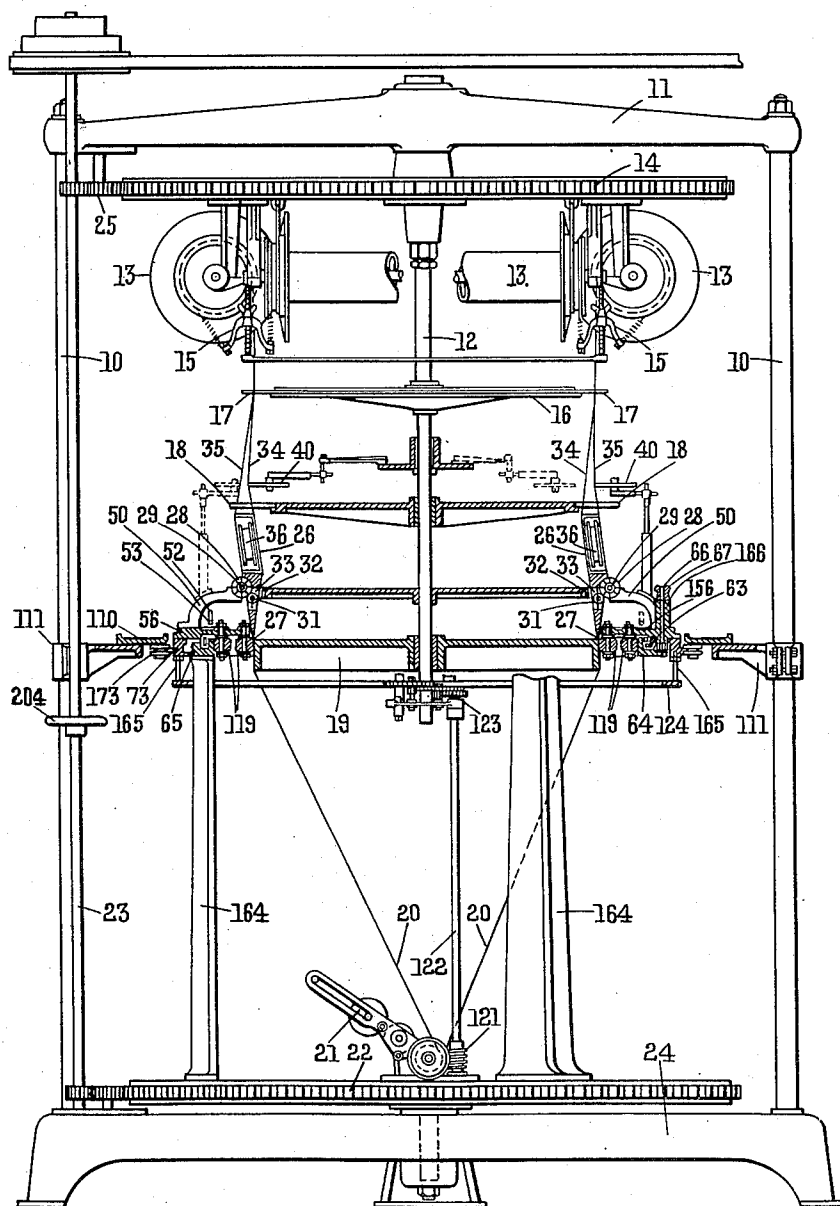


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FIG. 1.



inventor:
Joanny Jabouley
by
9 Saltzer and Lieberman
Attorneys

July 9, 1935.

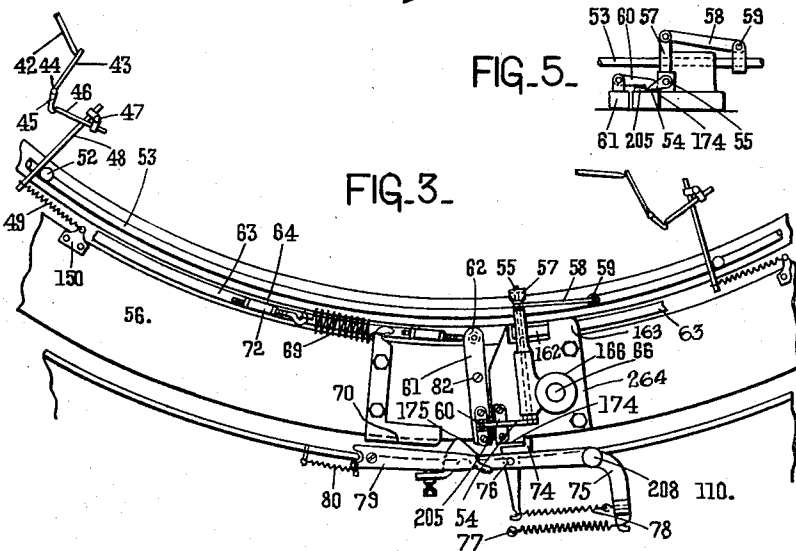
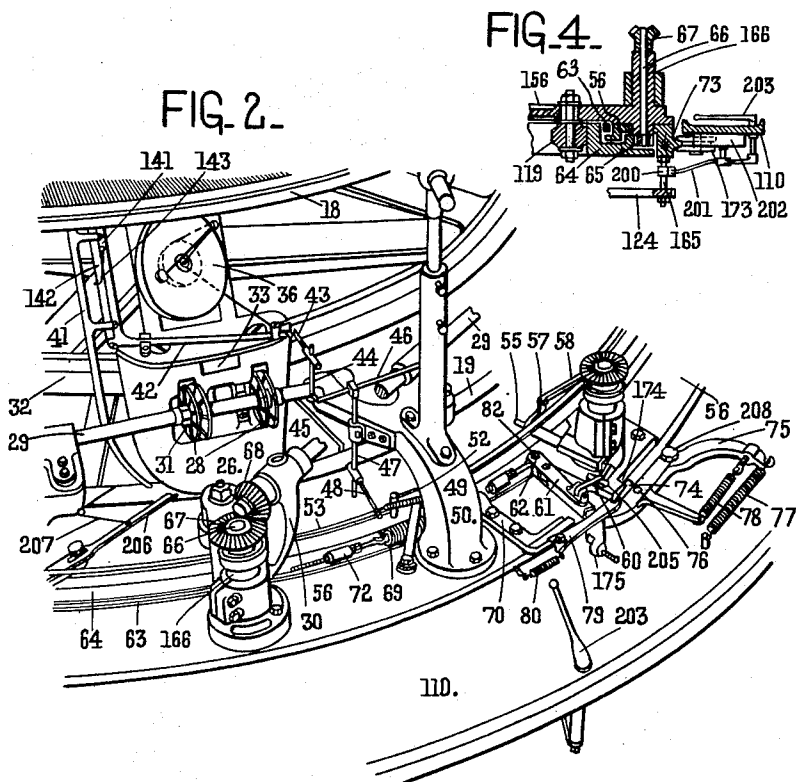
J. JABOULEY

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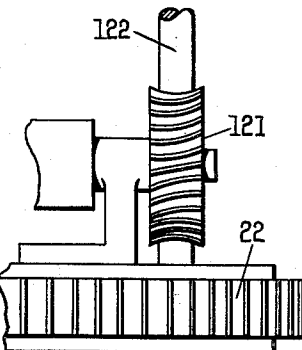
Inventor:
Joanny Jabouley
by
J. Seltzer + M. Weinstein
Attorneys

J. JABOULEY

TEXTILE APPARATUS

3 Sheets-Sheet 3

FIG. 7



Inventor
Joanny Sabouley
by
J Beltzer and Blufenstein
Attorneys

UNITED STATES PATENT OFFICE

2,007,397

TEXTILE APPARATUS

Joanny Jabouley, London, England, assignor, by
mesne assignments, to Celanese Corporation of
America, a corporation of Delaware

Application February 7, 1933, Serial No. 655,560
In Great Britain February 11, 1932

7 Claims. (Cl. 139—13)

This invention relates to circular looms, and is an improvement in the circular loom described in my U. S. Patent No. 1,822,292. The object of the invention is to provide improved means for bringing to an end relative circular motion between the shuttle or shuttles of the circular loom and the warps in the event of jamming or breakage of the warps, so as to avoid the damage which would arise if the movement were allowed to continue.

One object of the invention is positively to ensure relative rotation between the weft-inserting means and the warps during weaving.

Further objects of the invention are to provide means for bringing the weft-inserting means into rotation with the warps and then bringing the loom to rest, and also means to prevent relative motion taking place until the loom has been brought to rest.

Another object resides in the provision of hand-brake means encircling one of the relatively rotatable members and adapted to connect said member firmly to the other member so as firmly and rapidly to bring to an end relative motion between them.

A still further object is to provide latch mechanisms under the control of the warp threads and themselves controlling a further latch mechanism by which relative motion between the members is interrupted.

By the provision of a double-latch mechanism, the first of these mechanisms, that is the one directly operated by the jammed or broken warps, may be made extremely sensitive so that detection of the trouble takes place with great rapidity. At the same time the second latch mechanism may be made of a powerful character so that clutching together of the shuttles and warps follows detection of the trouble very quickly. In consequence further damage to the warps is prevented not only by the trouble being quickly detected but also by the relative motion between the shuttles and the warps ceasing almost instantaneously. Thus instead of a very slight warp trouble, such as the breaking of a single end, leading to the damage of a large number of warp ends, the loom can be stopped before any further damage takes place and it becomes merely a matter of repairing the single end which has been broken, or in the case of a jam, releasing the troublesome warp threads, when the loom can again be started in motion.

The sensitive latch mechanism is actuated by a detector member situated at the front of the shuttle, this member being engaged by any

jammed or broken warp threads to release the sensitive latch mechanism provided for that shuttle. In order to provide for no matter what part in the shed jamming or breakage of the warp threads takes place, the detector member engaged by the threads has its length over the full depth of the shuttle in the shed. A particularly sensitive form of detector member is described in my co-pending U. S. application S. No. 655,561 filed February 7, 1933.

The mechanism according to the invention may be applied to looms in which the shuttles rotate within sheds formed by the stationary or rotating warps, or in which the shuttles are stationary while the warps rotate. The invention is particularly useful in connection with circular looms having vertical axes and especially looms in which the weight of the shuttles acting within the shed serves to effect beat-up of the weft.

The invention will now be described in greater detail with respect to the latter class of loom, employing stationary shuttles, and with reference to the accompanying drawings, but it is to be understood that this description is given by way of example only and is no respect limitative.

Fig. 1 is a part sectional elevation of the loom; Fig. 2 is a perspective view of part of the loom; Fig. 3 is a plan view of the part corresponding to Fig. 2;

Fig. 4 is a sectional view showing details of Figs. 1 and 2 to a larger scale;

Fig. 5 is a detailed elevation of a latch mechanism shown in plan in Fig. 3;

Fig. 6 shown to a larger scale the gear shown in Fig. 1 for driving the take-up device, and

Fig. 7 is a semi-diagrammatic side elevation corresponding to Fig. 6.

The loom comprises a vertical frame 10 carrying at its upper end a spider 11 or like support for a downwardly depending control shaft 12. Four warp beams 13 are carried by a frame 14 mounted at the upper end of this shaft 12, the beams being geared together and provided with suitable braking means 15 to regulate the let-off of the warps. Below the warp beams 13 is a horizontal ring 16 provided with a series of guide holes 17 through which the warp threads pass. Still further down the shaft is a circular reed 18 and also a circular ring 19 whose upper edge is arranged at the level at which the weft is beaten up into the fabric 20. The fabric 20 proceeds from this ring in double form to a take-up device 21 which is mounted in a frame 22 rotatable by a vertical shaft 23 carried by the base plate 24 of the loom. The take-up device 21 is driven by a

worm 121 on the lower extremity of a vertical shaft 122 which in turn is driven through a train of wheels 123. One of the wheels of the train 123 is in constant mesh with a normally stationary circular rack 124, to be described later, and by rotation of the frame 22, which carries the shaft 122 around the periphery of the rack 124, the drive is transmitted to the fabric take-up device 21. The rate of take-up may be adjusted by varying the ratio of the train of wheels 123. The shaft 23 is equipped with a hand wheel 204 by means of which the shaft may be rotated when effecting adjustments. This shaft 23 is connected by gearing 25 to the support 14 carrying the warp beams 13, a motor (not shown) being provided to effect rotation of these members.

The shaft 122 is supported at its upper end by one of a pair of brackets 126 carried by the underside of the rotatable ring 64, the wheel *a* of the gear train 123 meshing with the normally stationary rack 124 and driving by means of intermediate gears *b*, *c*, *d* the gear *e* on the shaft 122 (see Fig. 6) as the shaft 122 is carried bodily round the loom by the rotation of the ring 64 and the frame 22.

The shuttles 26 are carried below the reed 18 with their lower edges 27 at the level of the upper edge of the ring 19 carried at the lower end of the central shaft 12. The shuttles 26 are held against rotation by means of vane wheels 28 carried on a series of shafts 29 mounted in bearings 30 carried by a rotatable but normally stationary ring 56 outside the warp circle. These wheels 28 enter recesses 31 in the shuttles 26 and, in conjunction with an inner race 32 engaging rollers 33 mounted on vertical axes in the shuttles 26, support the shuttles and limit their movement within the warps. The sheet of warps 34 passing over the inner face of the shuttles moves between the rollers 33 in the shuttles and the opposing race 32; the outer sheet of warps 35 is divided by the vanes of the vane wheels 28 and so is enabled to pass the shuttles freely, notwithstanding the interposition of the vane wheels 28. A finger 206 bearing an extension 207 (Fig. 2) is adjusted so as to vibrate the warps to maintain even spacing and to assist in the proper presentation of the warp threads to the weft-inserting means. Such a finger is described in detail in U. S. application S. No. 655,559 filed February 7, 1933. The weft is carried by a spool 36 in a recess in the upper part of the shuttle, for example in the manner described in my co-pending U. S. application S. No. 655,558 filed February 7, 1933, and is led by suitable guides to a point at the rear end of the lower edge of the shuttle, so that it is led into the shed close to the fell 27 of the fabric 20, where it is beaten up by the succeeding shuttle.

The shedding may be effected in any suitable manner, as for example by individual healds operated by cams or other devices having dobby or jacquard mechanisms, or by healds working in sections, or by shedding arms of the type described in my earlier Patent No. 1,626,411. For the weaving of plain or comparatively plain fabric, however, the reed itself may be arranged to effect shedding, such a reed being so arranged that some of the warp threads have restricted movement along the reed spaces while the remainder of the threads are permitted to have little or no movement. Such a reed is described in detail in said Patent No. 1,626,411. In the arrangement herein illustrated, discs 40 are arranged to press above the reed level, upon warp threads which are led through the reed 18 of the character above-men-

tioned, so that threads which are free to move in the reed are separated from those which are restricted. Thus, a shedding motion is commenced which can be completed by the shuttle entering between the separated warps and forcing them apart so that one sheet of warps slides along one side of the shuttle and the other sheet along the other side. Should shedding not take place properly, so causing a jam in front of any shuttle, or should a broken warp thread also produce a jam, the motion of the warp threads past the shuttle would result in the shuttle breaking a considerable number of the warps. A feeler member 41 is therefore provided on each shuttle, this member being connected to a rod 42 horizontally movable on the shuttle body, so that when the nose encounters a warp jam it forces the rod beyond the rear of the shuttle and through the outer sheet of warps. A warp feeler device of this type is described in U. S. application S. No. 655,561 filed February 7, 1933 which shows a feeler member 41 connected to a substantially vertical member 141 which forms part of a horizontal push-rod 42 situated within the shuttle. A link 142 suspended from a point within the shuttle and adapted to bear at least part of the weight of the members 41, 141 and 142, allows of great sensitivity of the system so that a slight pressure on the feeler 41 is transmitted to the push rod 42 substantially without loss due to friction. A light spring 143 fixed on the member 141 and hooked over the edge of the link 142 is adapted to urge the feeler 41 outwardly from the nose of the shuttle, but is not strong enough to offer undue resistance to repression of the feeler 41.

Opposite the end of this rod there is mounted a light finger 43 carried on a vertical spindle 44 in such a manner that the tip of the finger is just clear of the warp. The vertical spindle 44 has at its lower end a latch 45 engaged and retained in position by the end of a further light finger 46, mounted on a vertical spindle 47 supported from an arch 50 which at its lower end is provided with a rod 48 connected by a strong spring 49 to a member 150 mounted on the ring 56 carrying the bearings 30 for the shafts 29 on which the shuttle-holding vane wheels are mounted. This spring 49 urges the two members 45, 46 of the latch mechanism together but is prevented by the latch mechanism from contracting until release takes place by a horizontal movement of the rod 42 carried by the shuttle 26. When, however, the latch mechanism 45, 46 is released the spring 49 pulls strongly on the rod 48 to which it is connected and causes the rod 48 to contact with an abutment 52 mounted on a hoop 53 extending round the loom, there being one of these abutments 52 for each shuttle 26 and associated latch and spring mechanism.

Each spring 49 is strong enough to rotate the hoop 53 carrying the abutment 52 and cause the hoop 53 to move a catch 54 which is mounted at one end of a spindle 55, pivoted on the bearing-carrying ring 56, this spindle 55 having at its other end a lever 57 connected at 59 by a link 58 to the hoop 53. The catch 54 serves the purpose of releasing a second latch 60, which is normally hooked over and retained by an abutment 205 (see Fig. 5). The latch 60 is pivotally mounted at one end of a lever 61 fulcrumed at 82 and whose other end is connected at 62 to the free end of a brake band 63 which encircles a ring 64 rotating with the warps 13 and forming a cylindrical friction surface. The band 63 lies within a recess in the side of the ring 56 facing

the ring 64 (see Fig. 4). The ring 64 carries a gear 65 (Figs. 1 and 4) which drives vertical shafts 66 whose upper portions are borne within casings 166 mounted on the ring 54. The drive is transmitted through bevels 67, 68 to the shafts 29 upon which the vane wheels are mounted. The ring 64 is connected to the rotatable frame 22 of the loom by standards 164 by which the ring 64 is rotated at the same rate as the rotation of the warps. Vertical guide rollers 119, 119 suspended from an arm 156 of the member 166 are mounted between the ring 64 and the ring 19 and serve to maintain the course of the rings substantially concentric with the axis of the loom. The brake 63 is urged towards contact with the ring 64 by a spring 69 secured to a ramp 70, but during normal running is restrained by the catch 60 on the lever 61 which is connected to the end of the brake at 62.

So long as the catch 60 prevents movement of the lever 61, the lever holds the brake band 63 inoperative; when, however, the lever 61 is freed, the end of the band 63 connected to the lever is able to move to the right under the pull of the spring 69. The other end 162 of the band 63 is hooked behind the projection 163 of the plate 264 secured to the ring 56. Therefore, the pulling of one end of the band 63 by the spring 69 contracts the band firmly on to the ring 64.

Since the band 63 is connected at its ends to the ring 56 through the spring 69 and the plate 264, the gripping of the ring 64 by the band causes the ring 56 and the vane wheel shafts 29 carried thereby to be rotated solid with the ring 64. Accordingly, the shuttles 26 held by the vane wheels 28 on the shafts 29 are carried round the loom at the same speed as the warps. After cessation of relative motion between the two rings 56, 64, the shafts 66 are no longer driven and the vane wheels 28 stop rotating.

The spring 69 on the brake band is adjustable at 72 and very powerful in action so that clutching together of the two members 64, 56 takes place very rapidly, there being frictional engagement with practically the whole circumference of the ring 64. Since however the power required to release this spring 69 is obtained from the spring 49 which is released on operation of the first latch mechanism 45, 46, the first latch mechanism can be made very delicate and sensitive in operation.

A stop 74 engaging an abutment 174 on the plate 164 is provided, which ordinarily prevents rotation of the ring 56 carrying the shuttle-holding shafts 29. On release of the brake band 63, this stop 74 is removed from the abutment 174 by the end of the lever 61 which carries the brake holding latch 60, engaging a projection 175 on the lever 75 fulcrumed at 208 and carrying the stop 74. A ramp 70 is provided on the ring 56 carrying the shuttle-holding shafts, which ramp ensures by its engagement with the projection 175 as the ring 56 commences its rotation that the stop 74 is not engaged by the end of the lever 61 carried by the ring 56. A spring 77 connected between one end of the lever 75 and the frame 110 urges the stop 74 into position to retain the shuttles stationary and the projection 175 into the line of action of the end of the lever 61 when that lever is released. In order to avoid damage to the mechanism should the lever 61 be re-set before the abutment 174 is in contact with the stop 74, the stop 75 may be pivotally mounted at 76 on the lever 75

and urged into operative position by a spring 78 which enables the stop 74 to give under excessive pressure.

In order to re-set the brake band 63 to de-clutch the two rings 64, 56 for normal running, a lever 79 is provided on the loom frame which can be pushed into the path of the lever 61 carrying the brake-holding latch 60 so that by turning the loom round slightly the latch lever 61 can be forced back and the latch 60 re-engaged. A spring 80 normally holds the re-setting lever 79 in a position where it cannot be engaged accidentally by the catch lever 61. The ring 56 carrying the vane wheel drive mechanism has an extended base 73 adapted to rest in the groove of a rotatable guide member 173, which is suspended from the outer fixed ring 110 mounted on supports 111 on the standards 10 of the loom. On rotation of the ring 56 the rotatable guide 173 serves to maintain the course of the ring 56 substantially concentric with the axis of the loom. The ring 56 carries downwardly depending columns 165 bearing the circular rack 124, previously mentioned, around which the train of wheels 123 rotates in driving the fabric take-up mechanism 21, as already described. In this manner the drive of the fabric take-up mechanism is stopped upon cessation of weaving, by reason of the relative motion between the circular rack 124 and the shaft 122 ceasing. One of the columns 165 carries an abutment 200 which on commencement of rotation of the columns 165 is adapted to strike a member 201 of an electric switch 202 controlling the drive of the loom and attached to the underside of the outer fixed ring 110. The rotation of the loom therefore is brought to a stop within a very short space of time after the stoppage of weaving. In order to re-start the loom the switch 202 is re-set by an upper control lever 203 extending above the fixed ring 110.

What I claim and desire to secure by Letters Patent is:—

1. A circular loom comprising relatively rotatable members carrying the weft inserting means and warps respectively, a clutch adapted to connect said members together, a latch mechanism, means under the control of the warp threads adapted to release said latch mechanism on breakage or jamming of the warp threads, and a further and more powerful latch mechanism adapted to be released by the first-named latch mechanism so as to put said clutch into engagement and bring the relative motion between said members to an end.

2. A circular loom comprising relatively rotatable members carrying the weft inserting means and warps respectively, a catch adapted to engage and hold one of said members so as to ensure positive relative motion between that member and the other member, and means under the control of the warp threads adapted to release said catch from said member so as to free the member and permit the relative motion between the members to come to an end.

3. A circular loom comprising relatively rotatable members carrying the weft inserting means and warps respectively, one of said members being normally stationary, a clutch adapted to connect said members together, a catch adapted to hold the one member positively stationary, and means under the control of the warp threads adapted to release said catch and to put said clutch into engagement on breakage or jamming

of the warp threads so as to connect the stationary member to the other member.

4. A circular loom comprising relatively rotatable members carrying the weft inserting means and warps respectively, a cylindrical friction surface on one member, clutch means connected to the other member and surrounding said friction surface, and means under the control of the warp threads adapted to contract said clutch means on to the friction surface so as firmly to connect said members together by friction over substantially the whole length of the friction surface.

5. A circular loom comprising a plurality of weft inserting means, relatively rotatable members carrying the weft inserting means and warps respectively, a clutch adapted to connect said members together, a latch mechanism in connection with each weft inserting means, means under the control of the warp threads adapted to release the latch mechanism on breakage or jamming of the warp threads in advance of a weft inserting means, a further latch mechanism adapted to hold said clutch out of action, and common means adapted to be actuated by any of the first-named latch mechanisms to release said further latch mechanisms so as to put said clutch into engagement and bring the relative motion between the said members to an end.

6. A circular loom comprising relatively rotatable members carrying the weft inserting means and warps respectively, one of said members being normally stationary, a clutch adapted to connect said members together, a catch adapted to hold the one member positively stationary, means under the control of the warp threads adapted to release said catch and to put said clutch into engagement on breakage or jamming of the warp threads so as to connect the stationary member to the other member, and means adapted to prevent re-engagement of the catch mechanism during rotation of the normal stationary member.

7. A circular loom comprising relatively rotatable members carrying the weft inserting means and warps respectively, one of said members being normally stationary, a clutch adapted to connect said members together, means under the control of the warp threads adapted to put said clutch into engagement on breakage or jamming of the warp threads so as to connect the stationary member to the other member, and means adapted to bring the members automatically to rest after the normally stationary member has been caused to rotate.

JOANNY JABOULEY.