Oct. 24, 1967 F. THOMAS 3,348,555

BARREL WASHING MACHINE

Filed Oct. 23, 1965 4 Sheets-Sheet 1

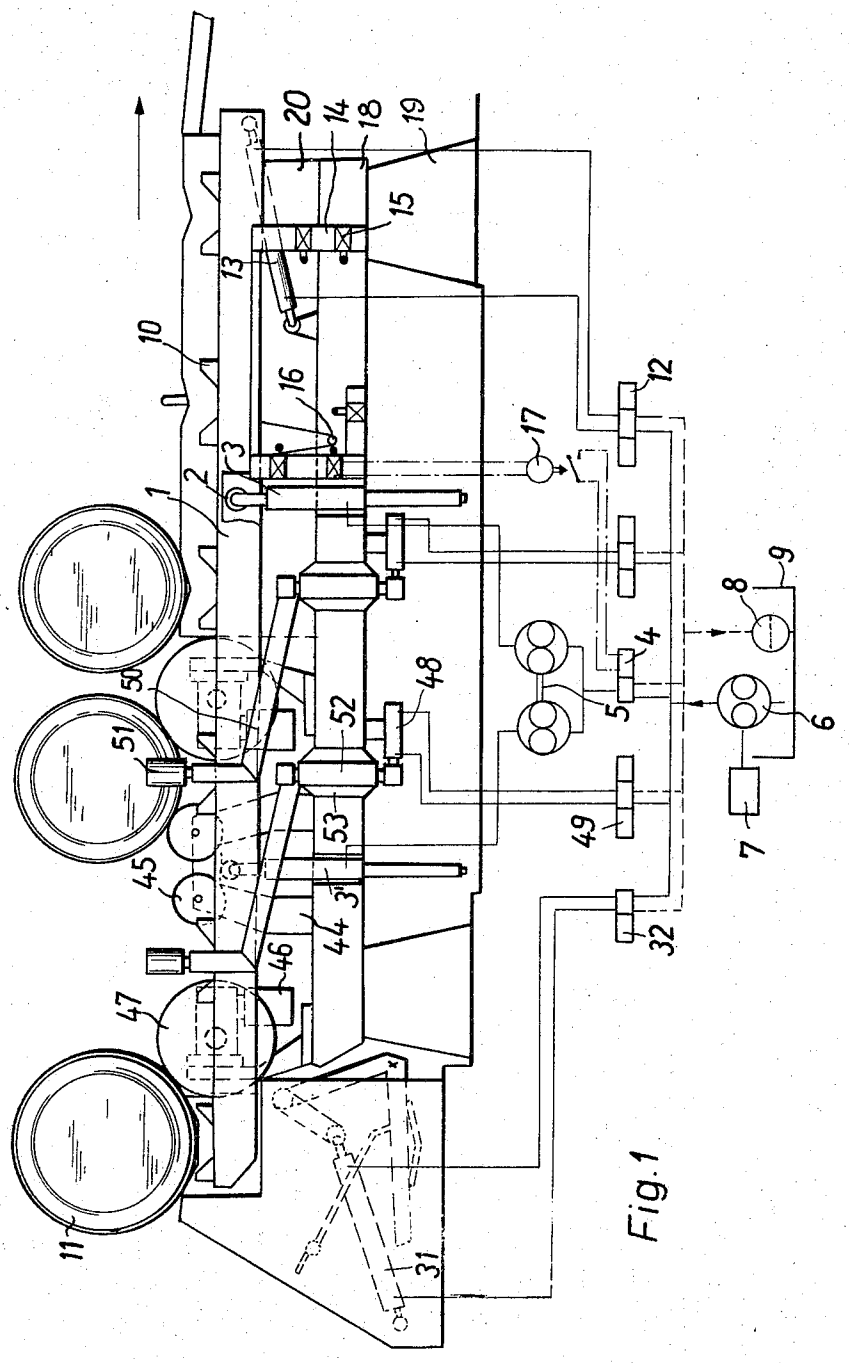


Fig. 1

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BARREL WASHING MACHINE

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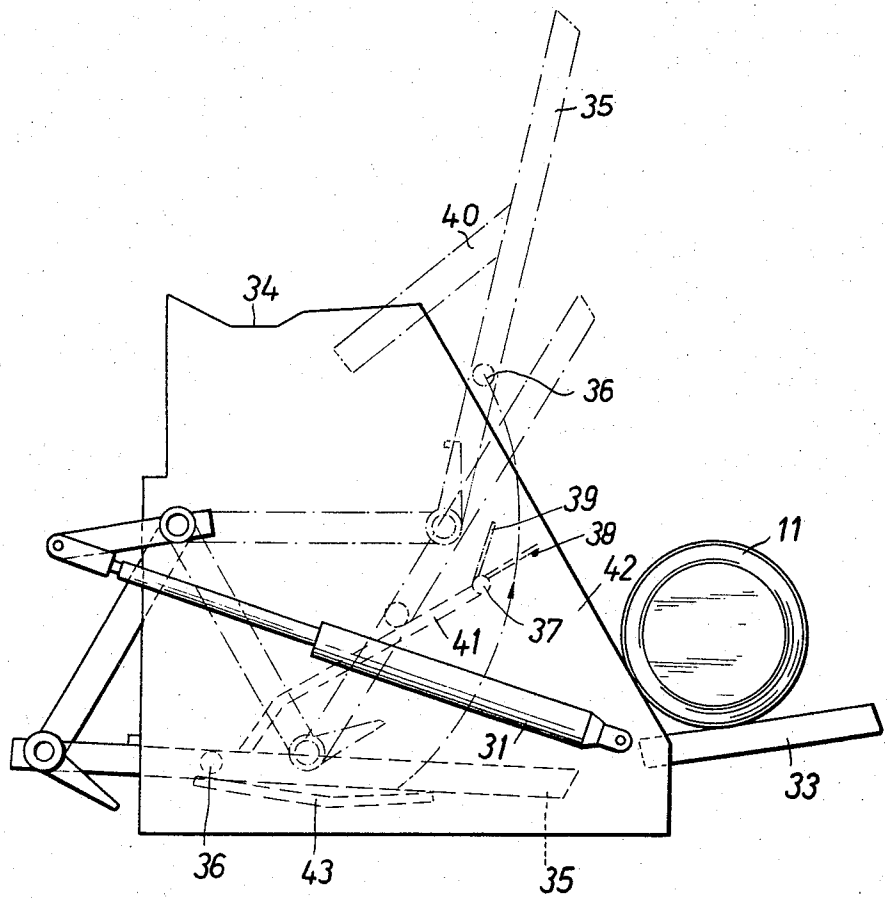


Fig. 2

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BARREL WASHING MACHINE

Filed Oct. 23, 1965 4 Sheets-Sheet 3

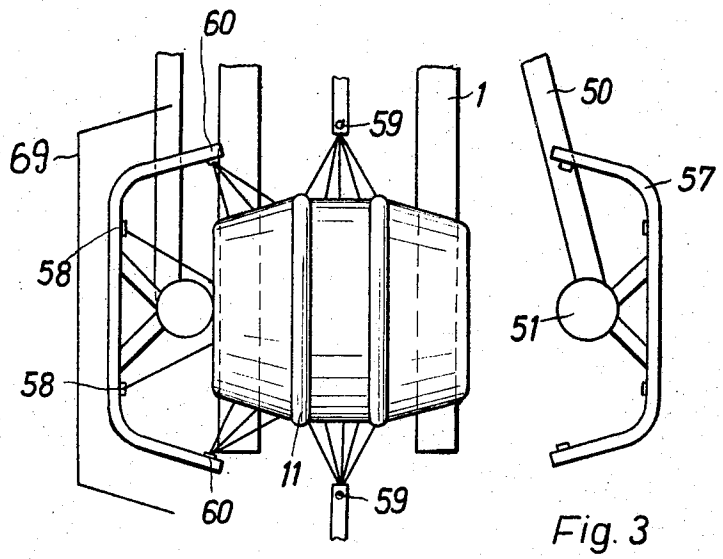


Fig. 3

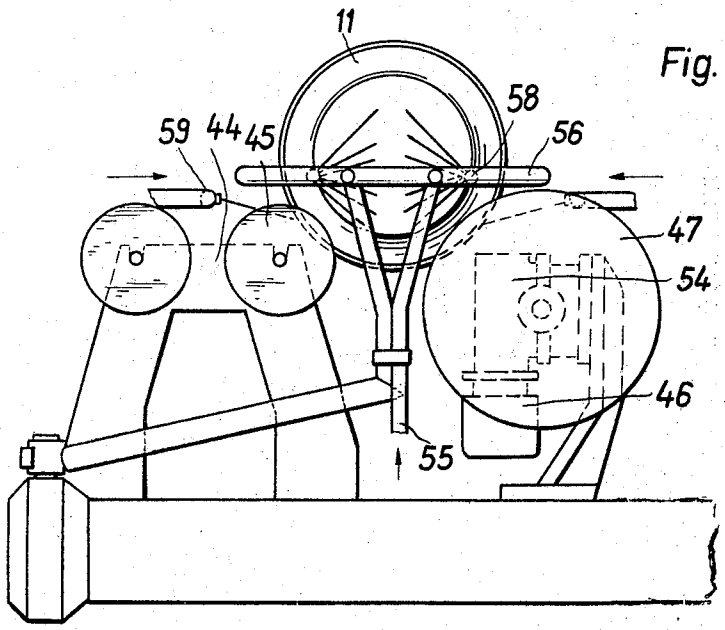


Fig. 4

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BARREL WASHING MACHINE

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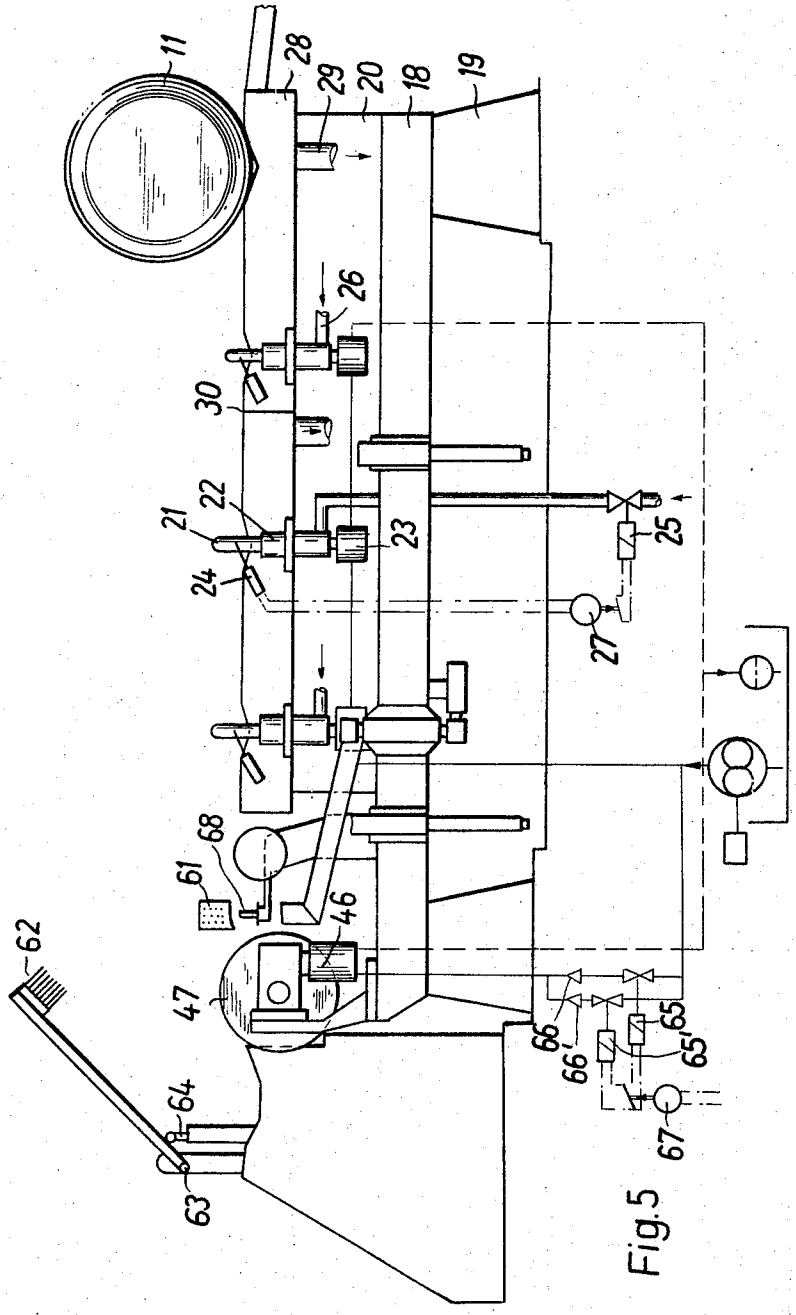


Fig. 5

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3,348,555

BARREL WASHING MACHINE

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16 Claims. (Cl. 134—43)

The invention relates to a barrel washing machine adapted particularly for washing beer barrels.

In the known barrel washing machines, as a rule, the barrels are conveyed on a circular or rectangular line from one working station to another by means of a swinging conveyor. The individual stations for the cleaning of barrels or the treatment of barrels respectively, are supported in stationary manner in the machine. The operations at the individual barrel treatment stations are thus controlled directly or indirectly in a well-timed manner by the drive of the swinging conveyor. The individual treatment stations are arranged in successive order as follows: preliminary filling station, external cleaning station, bung-hole detector station and centering station; as a rule, a number of spraying jet stations then follow for the internal cleaning; finally, there is a dripping-out station. In using these automatically operating barrel washing machines, about one-third of the total time of treatment of each individual barrel is required for its conveyance. In the case of very high conveying speeds, considerable difficulties occur in these known barrel washing machines, especially when washing small and light metal barrels. Such difficulties are mainly due to the fact that, because of the very high speeds of travel of the swinging conveyor, disturbances occur at the individual barrel treatment stations, at which barrels are received and from which barrels are delivered.

Hydraulic controls for barrel washing machines are already well known. There are, in particular, barrel conveying devices, the vertical and horizontal motion of which is effected by hydraulic pressure cylinders. The duration of the horizontal motions and also the duration of the forward and backward motions of the conveying device are regulated independently of one another by regulating the admission of hydraulic pressure to each piston side separately.

Contrary to machines having a swinging conveyor which is actuated mechanically by rotary crank gears wherein the swinging conveyor starts at zero speed, then reaches the maximum speed in the center of the crank, and then reaches zero speed again at the termination of the stroke, the hydraulically driven machines for the conveyance of barrels from one treatment station to the next station use only the same speed. The use of these machines involves the disadvantage that the barrels are always removed from their present position on changing their condition of rest into a condition of rapid motion; but also at the termination of the stroke the inertia of the barrels tends to move them on. If in these machines the conveying speed is reduced, a smaller output of the total barrel washing machine would, of course, result as measured by the number of barrels cleaned per hour. This difficulty has been avoided by actuating the swinging conveyor not directly by the hydraulic piston but by cranks, so that a mode of conveying is produced in which the swinging conveyor starts at zero speed and attains the maximum speed in the middle of the crank.

In known control devices for barrel washing machines, a control shaft for the opening and closing of valves for the internal cleaning stations is arranged on the side of the machine on which the lever or cam for controlling operations is located.

These well known controlling devices have many deficiencies. For instance, they are not suitable for machines

running at very high speed, nor do they operate smoothly, particularly because the motion of the conveyor is not sufficiently smooth. There are also known barrel washing machines where, according to the weight of the barrel received at the spraying station, the duration of spraying at an internal cleaning station is controlled by means of a spring valve or an electromagnetic valve connected with an electric switch.

When the barrel to be cleaned arrives at the spraying station, a valve in the feed pipe of the cleaning agent is opened and is closed again on removing the barrel. By actuating the valve in this manner and owing to the short time of conveyance from one spraying station to the next spraying station, a considerable portion of the cleansing liquid running out during the conveyance is carried to the next station, since the cleansing agent sprayed into the barrel can no longer run out of the barrel completely by the time it arrives at the next station. Therefore, different cleansing agents, for instance alkaline agents, are diluted or neutralized, and within a short time their cleaning effect is reduced considerably.

It is an object of the invention to eliminate the above disadvantages and to have the entire barrel washing machine operate fully hydraulically while using an electromagnetic sequence control which includes intercalated time-relays and variable condensers.

An important feature of the device of the invention is that the motion of the swinging conveyor and of the barrel lifting device, as well as the aligning of barrels at the external cleaning station and at the bung-hole detector station are effected by hydraulic cylinders which are fed with oil from a central point by means of electromagnetic control valves, and while, with the aid of gears, the driving rollers of the external cleaning station and the bung-hole detector station, as well as direct coupled spraying pipes of the internal cleaning stations, are set in rotation individually by slow-speed oil engines with high torque.

A further characteristic of the invention is the guiding of a hydraulically actuated lifting device which is constructed in such a way that upon sliding down into a protecting housing the arms of the lifting devices are pulled in backwards in the direction of the machine and arrive at a lower starting position without touching the next barrel arriving on the feed line which is to be lifted to the first station of the machine. Thus, the lifting device will not produce any slide marks on the barrel or damage it in any way.

Further features of the invention are directed to the external cleaning station of the barrel washing machine.

This external cleaning station possesses as its main feature several pairs of nozzles, of which preferably two are coordinated while one or several pairs of nozzles are aligned with respect to the center of the bottom of the barrels and inclined at an angle of preferably 25° in such a way that the reflecting water spray of the nozzles of each pair nullify one another and minimize the need for spray protection devices. Furthermore, each individual nozzle is aligned downwards at such an acute angle that the upper boundary of the jet spray corresponds to the radial distance of the largest barrel to be cleaned. Another pair of nozzles are provided for the cleaning of the middle of the belly of the barrel, the latter nozzles being inclined downwards from the horizontal at an angle of preferably 10° and being disposed in the direction of conveyance of the barrels. An additional pair of nozzles lie between the first and second pair of nozzles and are also inclined downwards at an angle preferably of 10°.

The primary advantage of the above-described external washing station lies in the fact that the closed costly spraying protecting housings used hitherto can be dis-

pensed with. Furthermore, the spraying nozzles are mounted on movable guiding arms which may be directed always at the same distance from the barrel to be cleaned, irrespective of the size of the barrel, so that the cleansing liquid need be sprayed by medium pressure only. As a result, smaller quantities of spraying liquid are required. Moreover, it will be sufficient to fit protecting sheets on the guiding arms in the upper region of the external washing station, in order to avoid the spraying out of water.

In the case of barrel washing machines with a low hourly output, as measured by the number of barrels cleaned, the external washing station and the bung-hole detector station may be combined to form one working station. For instance, if the external cleaning is effected with brushes, a rapid circumferential speed is required in order to prevent the barrel from becoming jammed between the brushes pressed against it. However, in order to insure a proper adjusting of the bung-hole detector in the bung-hole, a reduced circumferential speed is essential. If the driving of the proposed combined station were attained by the driving elements used with the barrel washing machines known hitherto, a disproportionately complicated arrangement would be required.

As a further feature of the invention, it is proposed in provide a hydraulic motor for the drive of the combined working station and feed same with pressure oil by means of two separate pipes of different throttle sections. At the expiration of the time required for the external cleaning, the pressure pipe with the larger throttle section for the quick drive of the rollers is closed by a time-relay, and the pressure pipe with the smaller throttle section for the slow drive of the rollers is opened.

As a further feature of the invention, it is proposed in the case of internal cleaning stations located one after another and spraying various cleansing liquids, to shorten the spraying time of the last spraying station, for instance, of a cleansing agent A, preceding the next spraying station, for instance, of a cleansing agent B, with the aid of a control element, preferably a time-relay, with the result that an emptied barrel will be delivered to said next spraying station for cleansing agent B. By this means, the diluting, neutralizing, and mixing caused by carrying off of cleansing agents which are often re-pumped in a cycle, is avoided. The cleansing of barrels is thereby considerably more effective and economical.

In the drawing is shown a hydraulically operating barrel washing machine in accordance with the invention, wherein:

FIGURE 1 is a side view of a barrel washing machine with a hydraulic control schematically represented in accordance with the invention;

FIGURE 2 is a side view of the barrel lifting device of the machine of FIG. 1;

FIGURE 3 is a top view of a schematic representation of the external washing station of the machine of FIG. 1;

FIGURE 4 is a side view of the external washing station of FIG. 3; and

FIGURE 5 is a side view of a modified version of the machine of FIG. 1, wherein a combined external brush cleaning and bung-hole station is shown with several connected internal spraying stations.

As is seen in FIG. 1, a swinging barrel conveyor **1** rests on rollers **2** of lifting or draw cylinders **3**, **3'** respectively. These lifting and draw cylinders operate jointly in parallel position and are hydraulically controlled by an electromagnetic valve **4** which controls the drive of mechanically coupled oil pump **5**. Alternatively, the valve **4** could in turn control separate valves for the supply of pressure fluid to the individual cylinders **3**, **3'**. The total hydraulic system is fed with a hydraulic fluid such as oil, by pump **6**, which is driven by an electric motor **7**. The oil is recirculated from the barrel washing machine and passes through reflux screens **8** to an oil container **9**. Upon vertical upward movement of the lifting and

draw cylinders respectively, the swinging conveyor **1** is lifted and by means of its pickup cams **10**, supports the barrels **11** lying at the individual treatment stations. The swinging conveyor **1** is moved together with the barrels supported thereon in its working direction by the distance between the individual treatment stations, under the action of cylinder **13**, which is controlled by electromagnetic valve **12**. After reaching such station, the swinging conveyor **1** is lowered vertically by actuating valve **4** and the cylinders **3**, **3'** controlled thereby, so that the barrels are thereby delivered to the next working station. The swinging conveyor is then brought back to its starting position by means of valve **12** and cylinder **13**, so that every point of the swinging barrel conveyor has moved along a rectangular path. On the side of the machine are fitted in a frame **14**, electromagnetic control switches **15** for the individual operations. These switches are controlled by a cam **16** welded on the swinging barrel conveyor. Thereby, the next operation can start only after termination of the preceding one. When the swinging conveyor has reached its starting position after one cycle of movement, the output of the whole machine is then regulated by an intercalated time-relay **17**. By means of this time-relay intercalated at this point, regulation of the output of the machine can be effected very simply by extending or shortening the interval of inaction, whereas the rectangular motion of the swinging conveyor itself always continues within the same time. The individual stationary treatment stations of the barrel washing machine (FIG. 1) rest on a support **18** which lies on two foundation bases **19**. Thus the conveyor is automatically driven in a cycle constituted by initial raising, lateral shifting, lowering, and return shifting to its original direction, all under the action of hydraulic members as controlled by the time-relay **17** and the closing and opening of the switches on the frame of the machine by the cam **16**.

The internal barrel spraying stations are secured in an edgewise-erected U-support **20**, which in turn is fastened to support **18**. Each spraying station comprises, as is well known, a spraying tube **21**, a housing **22** for said tube **21**, and an individual drive constituted by an oil engine **23** having low speed and high torque secured to housing **22**. The engines **23** are connected expediently in series. Alternatively, the tubes **21** can be individually driven by gears or knurled wheels and a single oil engine can be employed to drive a ribbed belt which in turn will drive the gears or wheels. Such belts can be composed of a steel lining with plastic teeth. The weight of the barrel **11** actuates an electromagnetic valve **25** by means of an end key **24** to conduct cleansing liquid through a connecting sleeve **26** and to actuate the brake motor of the liquid spraying pump respectively. At the final spraying station of a cleansing agent, the time required for spraying is shortened, for instance, by an intercalation of a time-relay **27**. The spraying or cleansing liquid coming out of the bung-hole, which is pointed downwards, runs into a collector tank **28** and through an outlet **29** into a container (not shown). From this container the liquid returns to the connecting sleeves **26** in a cycle under the action of a pump which is also not shown. The collector tanks **28** of the individual spraying stations preferably are constituted of plastic or stainless steel, the tanks being in firm abutting relation with one another with interposed packing discs or separating walls **30** between them. This design of the spraying stations is an important characteristic of the new barrel washing machine of the invention and insures an easy and quick interchanging of individual parts within a few minutes.

A lifting device for feeding the barrels to the conveyor **1** (FIG. 1) is actuated hydraulically by a cylinder **31** and a special electromagnetic valve **32**. The lifting device as shown in detail in FIG. 2 conveys the barrels to be treated from a feed station **33** to a barrel receiving station **34** of the machine. Arms **35** of the lifting device carry the barrels along a circular arc under the control of a lateral

guide roller **36** which is moved along a circular arc as shown in chain dotted lines in FIG. 2. As the guide roller **36** moves along its arc it lifts a ratchet **39** which is movable around a fixed pivot **37** and which normally lies on a pin **38**. Controlled by a time-relay, the arms of the lifting device remain in their top end position for a period of time and the barrel rolls across the legs **40** to the receiving station of the machine. When the arms of the lifting device fall under their own weight when cylinder **31** is deactivated, the ratchet **39** conducts the guide roller across a rail **41** to its lower end position.

As a result, the arms **35** of the lifting device which project from a protecting housing **42** are conducted across the next barrel **11** at station **33** and are withdrawn into the protecting housing **42** without touching the barrel in a damaging manner. During the next operation, the arms of the lifting device are conducted by means of the guide roller **36** and a guide rail **43** under the barrel **11** which is to be next lifted. From the barrel receiving station, the barrel passes to the first treatment station, viz, the external cleaning station (FIG. 1). Each individual barrel is cleaned there externally with jets arranged as described hereafter, or in well-known manner with spraying jets and brushes. The external cleaning station consists of a freely rotatable pair of rollers **45** lying in a support **44** and a large pair of rollers **47** driven by a hydraulic engine **46**. The rollers **47** are preferably provided with profiled rubber rings at their circumference. This treatment station can be interchanged in its entirety within a few minutes.

The construction of the next treatment station is similar to the external cleaning station. At this station inspection for the bung-hole is made in a manner already well known, viz., by means of a bung-hole detector under spring pressure, which detects the bung-hole and engages the same to hold the barrel fast in position, with its bung-hole pointing downwards. The lateral alignment of the barrels at these two stations is effected by cylinders **48** which are controlled by electromagnetic valves **49**. A piston driven by each cylinder **48** actuates guide arms **50** which carry guide rollers **51**. A bearing **52** for the respective arms **50** is fixed by struts **53** to the support **18**. It may also be welded to it. For setting a barrel in its particular position, two guide arms are moved simultaneously by the piston rod of an associated cylinder **48** in the direction of the center line of the barrel washing machine. As soon as the guide rollers **51** strike against the barrel bottoms of the received barrel **11**, the pressure is released from these hydraulic cylinders, preferably by adjustable condensers, so that no compression pressure is exerted on the barrel lying between the guide rollers. When the swinging conveyor **1** is lifted again by the lifting and draw cylinders **3**, **3'** respectively, the two guide arms are previously withdrawn owing to the automatic control.

In FIGS. 3 and 4 are seen special features of the external cleaning station. As shown, the barrel **11** lies between the freely rotatable pair of rolls **45** and the driving pair of rolls **47**, the latter being driven by the oil engine **46** and gear **54**. After the barrel has been placed on the pairs of rolls by the swinging conveyor **1**, in the manner already described, the guide arms **50** with the guide rollers **51** on the opposite sides of the barrel are moved in parallel position towards the barrel by the hydraulic cylinder **48** under the control of electromagnetic valve **49**, and the pipe **55** carrying the cleansing liquid is opened. In FIG. 3 the left guide arm is shown in a guiding position and the right guide arm in an open position.

On the guide arms are secured water feeding pipes **56** which preferably are at the level of the horizontal tangent of each drive roller **47** and which have bends **57** with arms extending at an angle of preferably 120°. On the ends of the arms and between the bends are disposed flat steel nozzles **58**, **60** in respective pairs which produce jet sprays with a spraying angle of about 60°. The dimensions of the bent feed pipes are such that, due to the form of the bend, the largest barrel to be cleaned can be sprayed at a favorably close distance. During the spraying action, the barrel turns continuously. The pairs of jets **58** are positioned relative to the center of the barrel bottoms in such a way, preferably at an angle of 25°, that the reflecting water sprays nullify one another so that extensive spray protecting devices are not needed. Also the nozzles **58** point downwards at an acute angle, so that the upper boundary of the spraying fan corresponds to the radial distance of the largest barrel to be cleaned. A second pair of nozzles **59**, which serve to clean the center of the belly of the barrel, are inclined downwards, preferably at an angle of 10° from the horizontal and are disposed in the direction of the conveyance of the barrels effected by the washing machine. The third pair of nozzles **60** apply a spray to the barrels between those of nozzles **58** and nozzles **59**.

FIG. 5 shows a barrel washing machine according to the invention which is similar to that of FIG. 1, except that it has a combined external cleaning station and bung-hole detector station. Furthermore, the internal spray stations are shown in detail in FIG. 5. The details of the structure of FIG. 5 which are similar to those of FIG. 1, have been omitted for purposes of clarity. In the arrangement in FIG. 5, external cleaning is effected by means of brushes. On the lateral guide arms **52**, the guide rollers are replaced by bottom cleaning brushes **61**. The belly brushes **62** are movable around pivot **63** and during the movement of the swinging conveyor, the brushes **62** are brought into the illustrated position in FIG. 5 by a piston **64** driven in a hydraulic cylinder. When a barrel is positioned in the external cleaning station, the belly brushes are placed on the barrel belly under their own weight. The jets required for spraying are well known and are not shown. The oil for the driving motor **46** of the driving rolls **47** is controlled by two electromagnetic valves **65**, **65'** and two throttles **66**, **66'**. During the external cleaning action and the rapid drive of the driving rollers, the throttle valve **66** with the bigger section is opened by valve **65**. After the time fixed by the time-relay **67** for the external cleaning, the valve **65** closes and the valve **65'** opens, allowing flow to the motor **46** via the pipe with the smaller throttle section **66'** for a slower rotation of the driving rollers. This insures the snap engagement of the spring loaded bung-hole detector **68** into the bung-hole of the barrels. During the external cleaning action, the bung-hole detector is held in withdrawn condition on the center of the belly of the rotating barrel by a cam welded on the inside of the swinging conveyor. Only after termination of the time-relay **67** will the bung-hole detector be released for action.

According to a special aspect of the invention, there are damping devices installed at the end positions of the individual hydraulic cylinders, which influence every motion of the swinging barrel conveyor, to reduce or brake the speed respectively, so that an entirely smooth working of the entire machine is insured.

The hydraulic system, electromagentic valves, oil pump assembly, and the regulator for the lifting and draw cylinders of the swinging barrel conveyor are installed preferably in a cabinet separately mounted, so that, at the time of mounting in place, only the connections between the machine and the control cabinet need be established. As a result, an extremely simple and quick installation of the machine, especially during the mounting in place, is insured.

Finally, in a way already well known, it is expedient to provide for spraying protecting sheets **69** at suitable points.

Of course, there still are numerous changes and modifications conceivable within the skill of one knowledgeable in the art with respect to the disclosed embodiment

without departing from the scope and spirit of the invention as defined in the attached claims.

What is claimed is:

1. A barrel washing machine having individual stationary treatment stations including a feed station for barrels to be treated, an external cleaning station and a bung-hole detecting station, said machine comprising first means for lifting the barrels at the feed station and depositing the barrels at the next treatment station, second means for aligning the barrels at the external cleaning station and at the bung-hole detecting station, third means for conveying the barrels to successive stations for treatment, hydraulic means coupled to the first three said means to drive the same, said hydraulic means comprising a single pressure fluid source for supplying pressure fluid from the source to said three means and a respective piston-cylinder arrangement for each of the said three means, valve means controlling operation of the hydraulic means, said valve means comprising a separate electromagnetic valve controlling actuation of a respective piston-cylinder arrangement, and control means for selective activation of the individual electromagnetic valves.

2. A machine as claimed in claim 1, wherein said third means has a cycle of operation composed of a rest period and a period of movement in which it undergoes displacement along a closed path, said third means moving along said closed path always in the same period of time, and means for controlling the time in which the third means remains in the rest period.

3. A machine as claimed in claim 2, wherein the machine has a succession of internal spray stations at which first and second cleansing liquids are sprayed against the barrel at successive groups of stations, the machine comprising means for supplying cleansing liquid to each of said groups of spray stations and means for shortening the time of spray at the last station of the first group.

4. A machine as claimed in claim 3, wherein the means for shortening the time of spray at the last internal station includes a time-relay at said station controlling the time thereat of spraying of the cleansing liquid, said time-relay being coupled to the means for controlling the time in which the third means remains in the rest period.

5. A machine as claimed in claim 1, wherein said third means comprises a rigid conveyor driven along a closed path which from a starting position is composed of a lifting motion, a shifting motion, a lowering motion and a reverse shifting motion to return the conveyor to its original starting position, a first piston-cylinder arrangement driving the conveyor in its lifting and lowering motions while a second piston-cylinder arrangement drives the conveyor in its shifting motion in both directions.

6. A machine as claimed in claim 5, comprising valve means controlling operation of the respective piston-cylinder arrangements, said first piston-cylinder arrangement consisting of two cylinders with pistons, and means for supplying pressure fluid to the latter two cylinders and pistons in concurrence.

7. A machine as claimed in claim 5, wherein said piston-cylinder arrangements include damping means in the cylinders for damping the ends of the strokes of the pistons.

8. A machine as claimed in claim 1, wherein said hydraulic means comprises a pump for pressurizing the fluid in said source, the machine further comprising means separately housing the source, pump and valve means as a unit assembly disposed separate from the stations of the machine.

9. A machine as claimed in claim 1, wherein said first means comprises a protective housing, guide arms in said housing for engaging and lifting the barrels, a lateral guide roller on the guide arms, a guide rail, a ratchet arm supported adjacent said guide rail for pivotable movement in only one direction and disposed in the path of the guide roller for being pivoted out of said path when the arms are being raised and for guiding the roller onto the rail when the arms are lowered such that the arms move to a retracted position away from the feed station and thereby do not contact the next barrel at the feed station.

10. A machine as claimed in claim 1, comprising means for supporting and rotating the barrels at the external cleaning station, means for directing jets of fluid in pairs against the ends of the barrels and including a first pair of fluid jets directed against the ends of the barrel at an angle of about 25° with respect to a central axis of the barrel such that reflecting streams of fluid nullify one another, said streams being also directed downwardly at an acute angle.

11. A machine as claimed in claim 10, wherein said means for directing jets of fluid in pairs further includes another pair of fluid jets for cleaning a central belly portion of the barrels, the latter jets being inclined downwardly at an angle of about 10° from the horizontal and being disposed in the direction of conveyance of the barrels.

12. A machine as claimed in claim 10, wherein said means for directing jets of fluid in pairs further includes another pair of fluid jets disposed between the aforesaid pairs of jets for cleaning the remainder of the barrels and directed downwardly at an angle of about 10° with the horizontal.

13. A machine as claimed in claim 12, wherein said means for directing jets of fluid comprises a horizontal fluid feed pipe including nozzles for directing said jets of fluid against the barrels, said means for supporting and rotating the barrels comprising drive rollers and free rollers for supporting the barrels, said feed pipe being disposed at a level immediately above the drive rollers, said feed pipe including a central portion and remote arms with free ends extending at an angle of 120° from the central portion, the nozzles for the first jets being located in the central portion, the nozzles for the third jets being located at the free ends of the arms, said jets having spraying angles of about 60°.

14. A machine as claimed in claim 1, wherein said external cleaning station and bung-hole station are combined into a single station at which external cleaning stages and bung-hole detection stages are successively effected, means for supporting and rotating the barrels at such station, said hydraulic means driving the latter means, and means controlling the hydraulic means to drive the barrels at high speed during the external cleaning stages and at low speed during the bung-hole detection stages.

15. A machine as claimed in claim 14, wherein said means controlling the hydraulic means for driving the barrels at high speed and at low speed comprises electromagnetic valves and throttle control means controlled by said valves.

16. A machine as claimed in claim 1, comprising fourth means for supporting and rotating the barrels at the respective external cleaning station and the bung-hole detecting station and fifth means for rotating an internal spray in the barrels at an internal spraying station, said fourth and fifth means including respective drive gear means, said hydraulic means comprising a fluid motor driving each drive gear means, said fluid motors being connected in series with said single pressure fluid source.

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