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ENGINEERING TEST MANUAL
REQUIREMENTS FOR WALK-BEHIND
POWER LAWN MOWERS

16 CFR Part 1205

ESDOC 541110

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Engineering Laboratory

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WALK-BEHIND POWER LAWN MOWER TESTING MANUAL APPROVAL RECORD

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I. INTRODUCTION

A. Background

The Consumer Product Safety Commission (CPSC) promulgated a safety regulation for power lawn mowers with an effective date of December 31, 1981. The regulation provides performance criteria and test procedures. In order to provide a uniform system of testing and specific details of how each test is to be conducted and reported within CPSC, this Engineering Test Manual has been developed. Additional guidelines, with regard to potential problems which might be encountered in performing the compliance tests, have also been incorporated into this document. Procedures to test innovative mowers that may be available in the future will be incorporated as amendments in this document as these mowers become commercially available.

B. Scope

This Engineering Test Manual sets forth the detailed test procedures, test equipment, test sequence, and report format certification to be utilized within the Commission in the compliance testing of power lawn mowers.

C. Applicable Documents

1. Power Lawn Mower Regulation 16 CFR Part 1205 (see appendix).
2. Blade Stopping Time (BST) Instrumentation Design Report.

II. GENERAL PROCEDURES

A. Safety Precautions

1. The test engineer shall be responsible for the safety, competence, and training of all test personnel. All tests shall be conducted in such a manner as to provide the maximum protection to those individuals conducting the test.

2. Special care should be exercised in handling the lawn mower whenever it is running.

(a) Read the operating and service instruction manual carefully and be thoroughly familiar with the control and proper use of the mower.

(b) Never run mower indoors in enclosed, poorly ventilated area. Engine exhaust fumes contain carbon monoxide, an odorless poisonous gas.

(c) Never fill the fuel tank indoors, while the engine is running, or while the engine is hot. Wipe off any spilled gasoline before starting the engine.

(d) When starting mower, pay attention to where feet should be placed so that they will not come in contact with the blade.

(e) Be sure all wheel drive and blade control equipment is in neutral; i.e., with clutch, belts, chains, etc. disengaged when starting mower.

(f) Never operate the mower without guards, plates, or other safety protective devices in place.

(g) Do not put your hands near the cutting blade when it is rotating and the engine is running. When adjustments are to be made, disconnect or remove spark plug. Maintain a proper distance from the mower at all times.

(h) When a helper or associate is near the mower, be careful that he is aware when the blade is energized (rotating) or is about to be energized.

(i) Never attempt to make a wheel height adjustment while the engine is running.

(j) Always stop engine if abnormal vibration is encountered. Check immediately for cause. Vibration is generally a warning of trouble.

(k) Always disconnect spark plug wire after use and secure it so it cannot accidentally contact spark plug.

(l) Allow engine to cool before storing.

(m) Never store mower with fuel in tank in poorly ventilated enclosures or where fuel fumes may reach an open flame or spark. Drain fuel into approved container, outdoors, away from open flame. Store gasoline in a well ventilated area, away from possible ignition sources.

(n) Electric mowers shall be adequately grounded.

(o) Do not operate electric mower in a wet test area.

B. Equipment Calibration and Accuracy

All equipment used in the performance of the tests shall be maintained in conformance with the Headquarters Laboratory Calibration and Maintenance Program. The selection of specific equipment to be used for each test shall be the responsibility of the test engineer, but in all cases the equipment utilized will provide the accuracy and precision necessary to withstand the scrutiny of possible legal actions.

C. Equipment

The following list prescribes the equipment to be used in the performance of the test as well as any equipment or apparatus specified in the Standard.

1. General Equipment

(a) Spring force gauge capable of applying compressive force up to 10 pounds and measuring force accurate to within ± 0.1 pound.

(b) Spring force gauge capable of applying static tensile force up to 50 pounds and measuring force accurate to within 0.5 pound.

(c) Assorted clamps.

(d) Stop watch accurate to 0.2 seconds.

(e) Blade stopping time test stand (see Figure 7).

(f) Blade stopping time measurement instrumentation (see Figure 7).

- (g) Meter scale
 - (h) Large "C" clamps
2. Specified Equipment
- (a) UK foot probe (see Figure 1).
 - (b) Obstruction test fixture (see Figure 6).

D. Sample Identification

A "sample" includes all items received under one sample number and may consist of several submissions (sub) and numbered accordingly. Upon receipt of a sample, each sub shall be permanently marked so that the identification will remain throughout the tests. Such markings shall be in a prominent location and not affect the results of the tests.

E. Test Sequence

The tests shall be performed in the order they appear in this manual.

F. Data Acquisition and Report Format

The CPSC Test Report for Power Lawn Mowers shall be used for reporting of all results. Use photos for clarification as needed.

G. Personnel and Test Report Certification

All reports shall be prepared on the form specified herein and shall be certified as to the accuracy and conformance to all the requirements of this test manual by the test engineer. Prior to the tests, the test engineer shall insure that all

test operators are familiar with the procedure of this manual especially the safety precautions.

III. TEST PROCEDURES

A. Walk-Behind Rotary Mower Shield Foot-Probe Test

1. When performing this test, determine whether the foot probe contacts the blade or causes any part of the mower to contact the blade.

(a) Observe the following test conditions:

- (1) Perform test on a smooth level surface.
- (2) Inflate pneumatic tires to the mower manufacturer's recommended cold pressure.
- (3) Adjust mower housing to highest setting relative to ground.
- (4) Adjust blade to lowest setting relative to mower housing.
- (5) Secure mower from horizontal movements, but allow free vertical movement.
- (6) Remove grass catcher.

(b) Remove spark plug from engine and slowly rotate blade and observe blade contact while doing the following:

Insert foot probe in any direction under all points of bottom edge of housing and shields within specified areas such that no part of the foot probe shall exceed the $\pm 60'$ vertical plane area (see Figures 1, 2, 3, and 4). See

paragraph 1205.4(b)(1)(ii) areas to be probed of the Safety Standard for Walk-Behind Power Lawn Mowers for additional explanation of the specified areas. Mark a template with $\pm 60'$ lines on it and place it under the mower to determine the limits of the vertical plane areas. When probing the chute area, insert the foot probe into the discharge chute at any angle to the line defining the chute opening (see Figure 5). During each insertion of the foot probe, the "sole" of the probe shall be kept in contact with the supporting surface. Insertion shall stop when the mower housing lifts or the horizontal force used to insert the probe reaches 4 lbs (17.8N), whichever occurs first. Use a 0 to 5 lb or 0 to 10 lb force gauge to apply the horizontal force. Withdraw the foot probe after each insertion, pivoting the "toe" upward around the "heel" as much as possible without lifting the mower. Note the area where any contact of the probe with the blade occurs or any part of the mower enters the path of the blade. Measure the depth of penetration of the foot probe or mower part into the plane of the blade and record on report form.

(c) Repeat foot probe test with auxiliary equipment acting as a shield (other than grass catcher) in place.

B. Walk-Behind Rotary Mower Shield Structural Integrity Test

1. Determine that the shields on the mower do not permanently deform, separate, or crack when subjected to the required force. (This requirement does not apply to the housing.)

(a) Secure the mower from horizontal or vertical movement with large "C" clamps and/or hold down clamps at each wheel attached to a secure platform.

(b) Using a 50 lb or larger force gauge, apply a static tensile force of up to, but not to exceed, 50.0 lb (222N) uniformly distributed over the maximum possible length of the shield; however, in no case shall it be less than 50 percent of the length. Any shield located totally or partially in the area designated for the foot probe test is subject to this test. The force shall be applied for at least 10 seconds in the direction which produces the maximum stress on the shield. Use templates or adjustable spline to determine deformation from the original shape. There shall be no visible evidence of cracks and or separation. Record location and amount of any permanent deformation, separation, or crack on the report form.

C. Walk-Behind Rotary Mower Shield Obstruction Test

1. Determine that the mower shields do not stop the mower as a result of contact with the raised obstacle or trough in Figure 6, enter the path of the blade, or cause more than one wheel at a time to be lifted from the fixture surface during the test. The distance between the trough and the raised obstacle should be such that the mower contacts only one at a time.

(a) Observe the following test conditions:

(1) Inflate pneumatic tires to the cold pressure recommended by the mower manufacturer.

(2) Adjust the mower housing at its highest setting relative to the ground.

(b) Push mower forward and pull rearward perpendicularly to and across both the depression and raised obstacle on the obstruction test fixture of Figure 6 without lifting the mower. Move at a speed not to exceed 2.2 ft/sec (0.7 m/sec). Initially, the tester should move at a very slow speed, then to no greater than maximum speed in order to observe mower characteristics within the test speed. The tester should practice with a stop watch in an attempt to maximize the speed without exceeding the limit. The test fixture may be relieved only to the extent necessary to prevent interference with any blade retaining device. Observe if the shield stopped the mower as a result of contact with the fixtures, whether the shields entered the blade path, and whether more than one wheel at a time raised from the ground while traversing the fixtures. The above are visibly determined with the aid of an observer. Record observations on the report form.

D. Walk-Behind Rotary Mower Moveable Shield Test

1. Test moveable shields, that are in any of the areas to be probed which are intended to be moveable for attaching auxiliary equipment. Determine that when moveable shields

are deflected to their extreme open position and released, they either return automatically to their former position when attached equipment is not present or prevent operation of the blade unless the attached equipment is present.

(a) Test for automatic return of a moveable shield by manually deflecting the shield to its extreme open position, then release the shield and visually observe that it immediately returns to the closed position with the attached equipment not present.

(b) If the shield does not automatically return to the closed position with the attached equipment not present, determine if operation of the blade(s) is prevented. To accomplish this, first manually deflect the shield to its extreme open position and then follow the manufacturer's instructions and complete the procedures necessary to operate the blade. Observe, using a mirror or any other safe method, that the blade(s) has or has not been prevented from operating. Record observations on the data sheet.

E. Walk-Behind Mower Blade Control System Test

1. For a mower with an engine and with manual starting controls, start the engine and determine that the blade controls stop the blade without stopping the engine. A mirror may be used. Record observation on report form.

2. Determine that the mower has a blade control system that prevents the blade from operating unless the operator actuates the blade control. Record observation on report form.

3. Determine that the mower has a blade control system that prevents the blade from operating unless the operator continuously contacts the blade control. Record observation on report form.

4. Release the blade control and observe that the blade has stopped; now restart the blade operation and determine that another means must be manually actuated to restart the blade. This additional means may be either a control which is separate from the control required in 2 above or may be incorporated into the control required in 2 above as a double-action device requiring two distinct actions to restart the blade. Record observation on report form.

5. Perform the blade stopping test in the following manner:

(a) Spray bottom of lawn mower blade with aluminum paint and allow to dry. If mower has circular blade, spray circular blade flat black, then spray with aluminum paint a 1 inch wide radial strip across its diameter to represent a blade to the BST test instrumentation.

(b) Put lawn mower on blade stopping time (BST) test stand (see Figure 7).

(c) Move timing disk vertically to approximately 1 inch from blade. If mower blade is tilted, tilt the timing disk approximately to same angle and secure adjustment screws.

(d) Move lawn mower until center of blade is aligned with centering pin of timing disk.

(e) Firmly clamp mower in aligned position using one clamp on the right front wheel and the other clamp on the left rear wheel.

(f) Fasten a microswitch on the lawn mower handle such that the switch actuates when the blade control device moves 1/4 inch or less from the position of maximum travel. For mowers that have electrical contact for blade control, the BST instrumentation may be connected or wired into this switch.

(g) Start mower according to the manufacturer's instructions.

(h) After lawn mower has been operating for a minimum of six minutes, engage blade control and bring blade up to speed with throttle in maximum position.

(i) Actuate reset buttons on BST instrumentation and BST timer.

(j) Release blade control (device) in a manner that does not affect the measurement and read BST on timer.

(k) Repeat timing measurements until a total of 10 measurements of BST have been made. Record on the report form.

F. Walk-Behind Mower Starting Controls Location Test

The following procedure is for mowers with an engine and whose blades begin operation when the power source starts.

Determine if starting means is located within the operating control zone. This is done by affixing a straight edge or meter stick tangent to the rearmost portion of the

mower handle. With the aid of a tape measure, make measurements as shown in Figure 8 to determine if starting controls lie within the specified cylinder.

IV. REQUIREMENTS FOR CPSC TEST REPORT FOR POWER LAWN MOWERS

The Power Lawn Mower Report Form used to report the results shall be per Appendix A. The names of the test personnel involved shall be inserted and final approval and responsibility shall rest with the Test Engineer.

V. FIGURES

Figure 1 - Foot Probe

Figure 2 - Area To Be Probed

Figure 3 - Area To Be Probed, Multi-Blade Mowers

Figure 4 - Area To Be Probed, Swingover Handle

Figure 5 - Probing Discharge Chute with Foot Probe

Figure 6 - Obstruction Test Fixture

Figure 7 - Blade Stopping Time Test Instrumentation

Figure 8 - Operating Control Zone

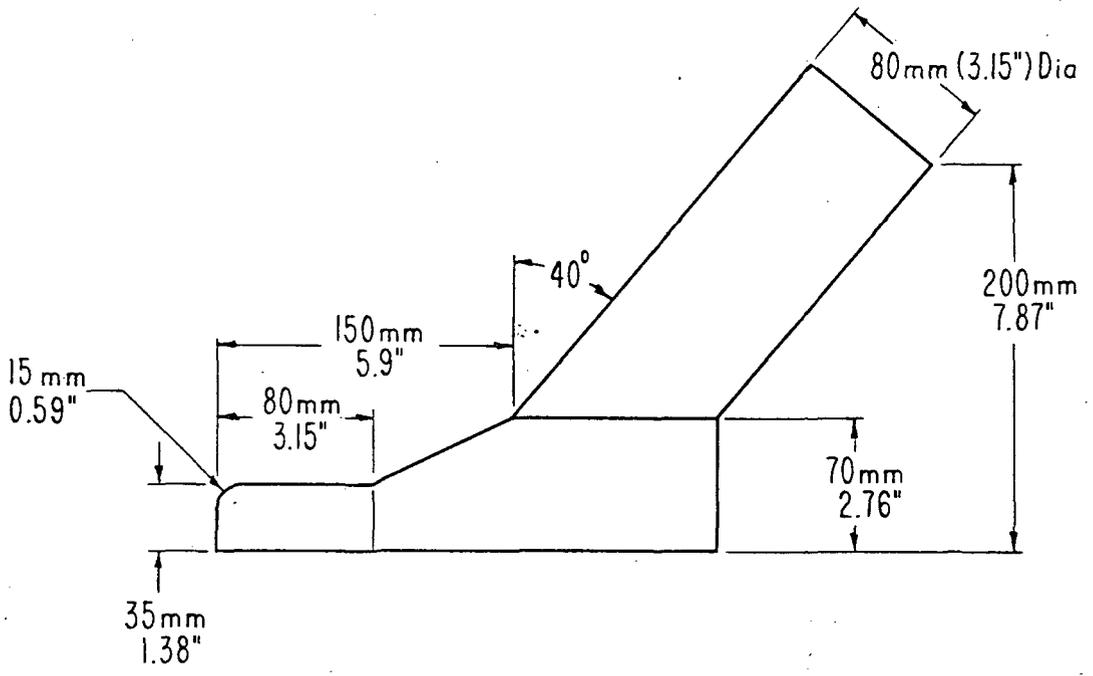
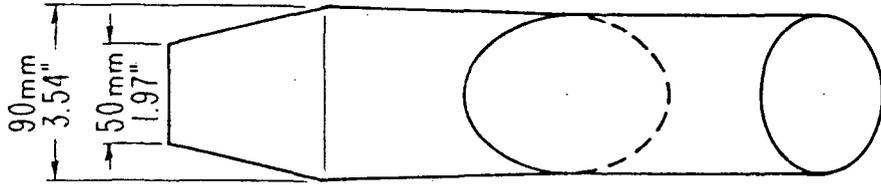


FIG 1—FOOT PROBE

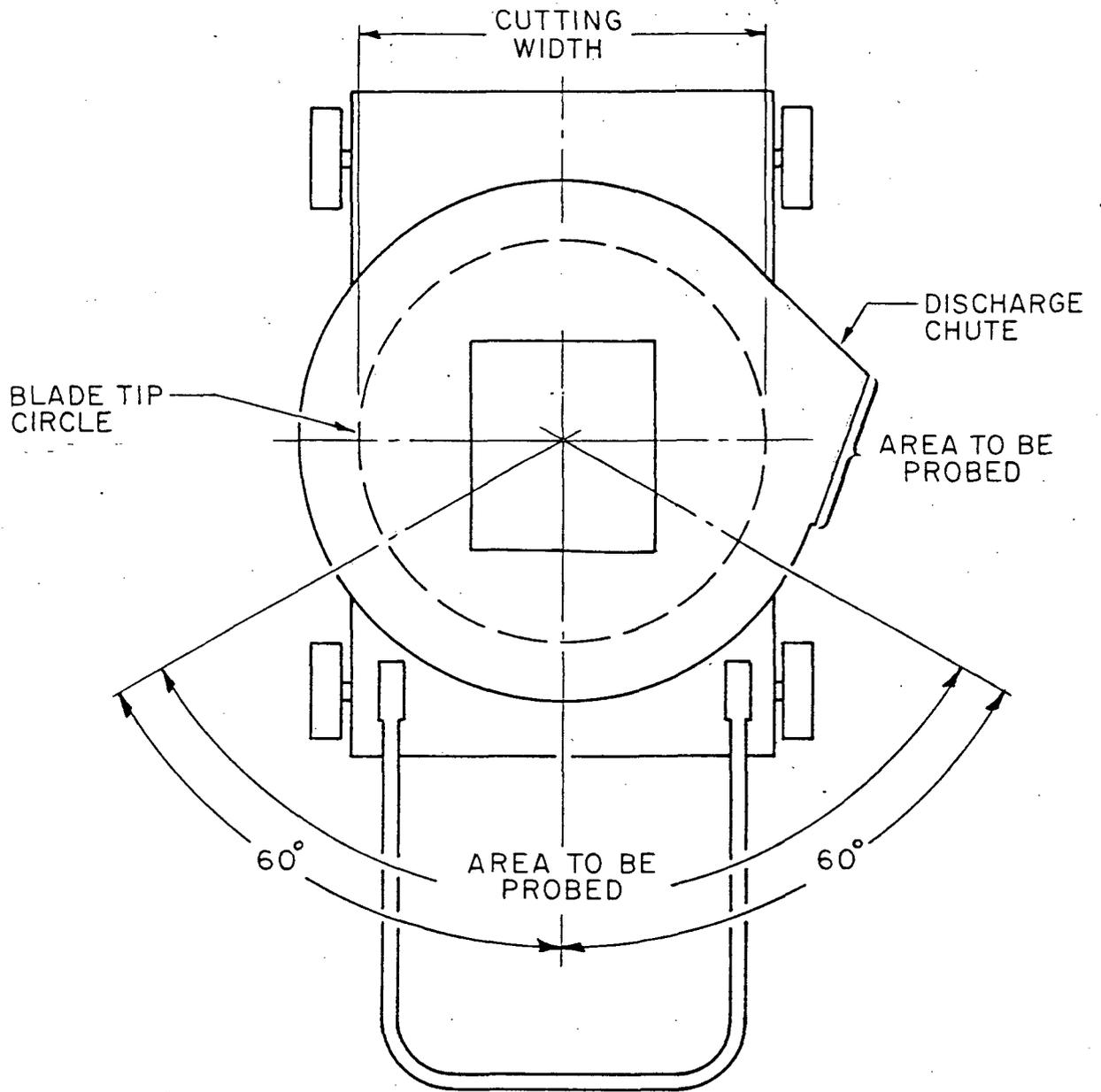


FIG 2—AREA TO BE PROBED

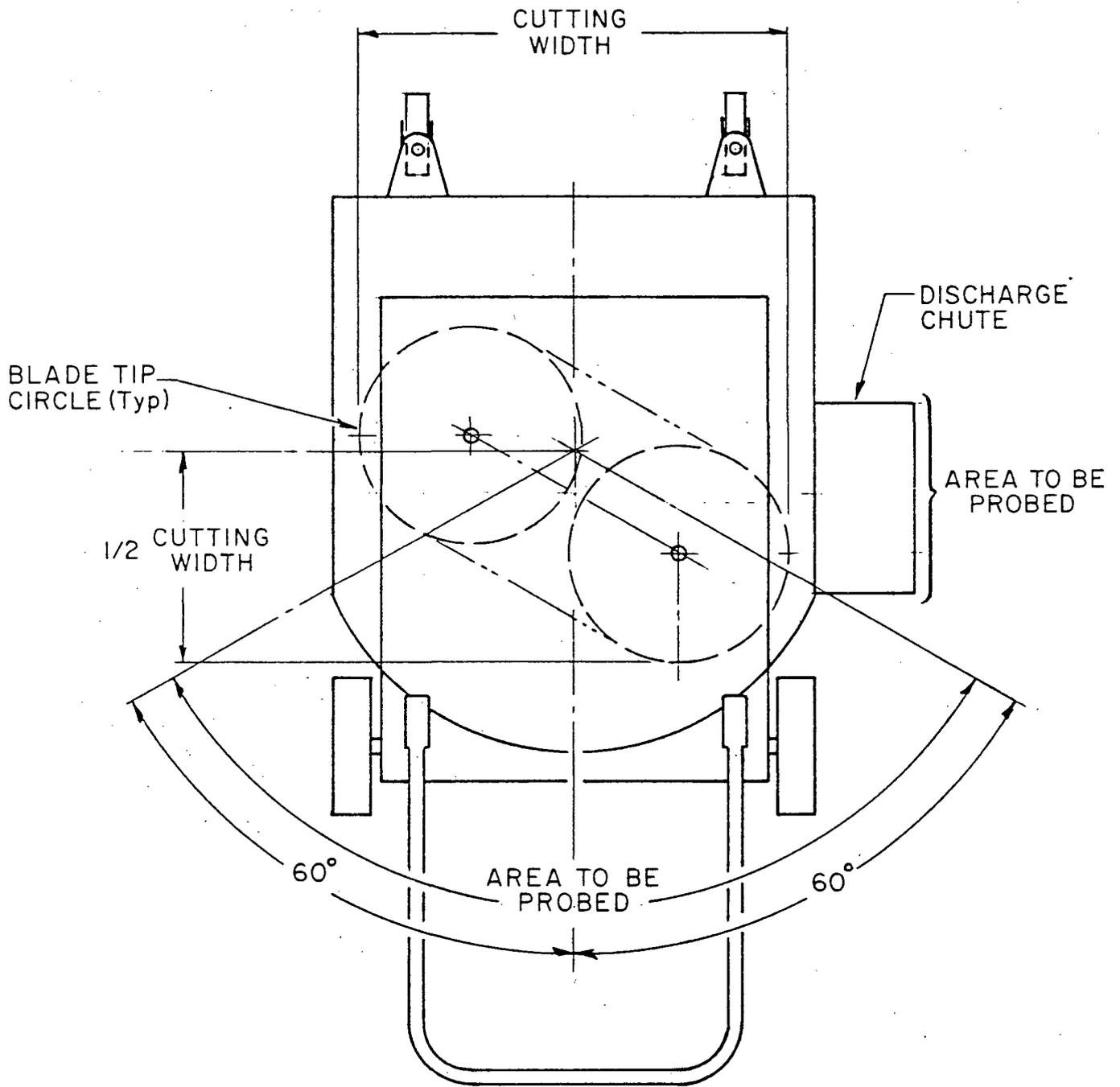


FIG 3—AREA TO BE PROBED
MULTI-BLADE MOWERS

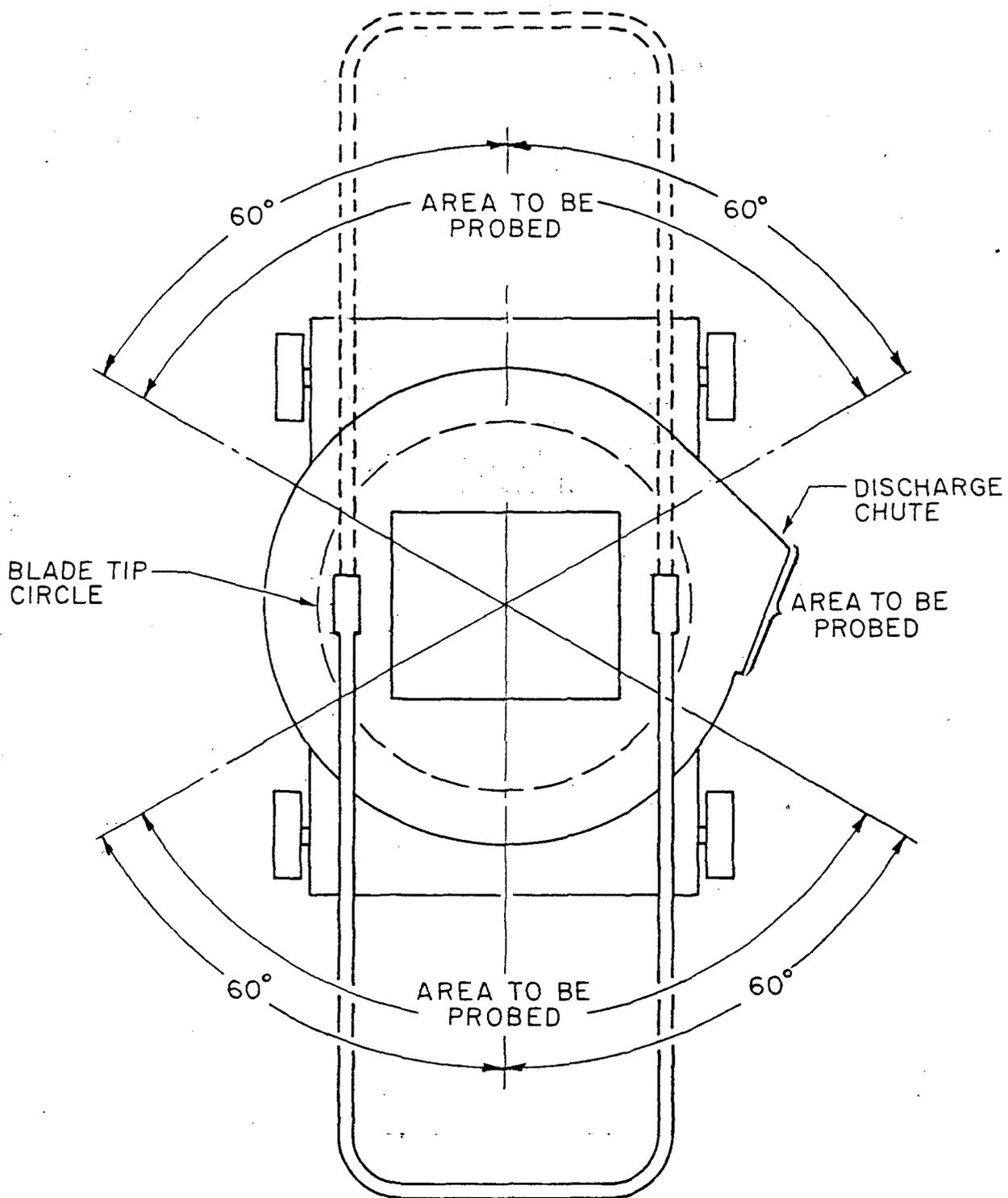


FIG 4—AREA TO BE PROBED.
SWINGOVER HANDLE

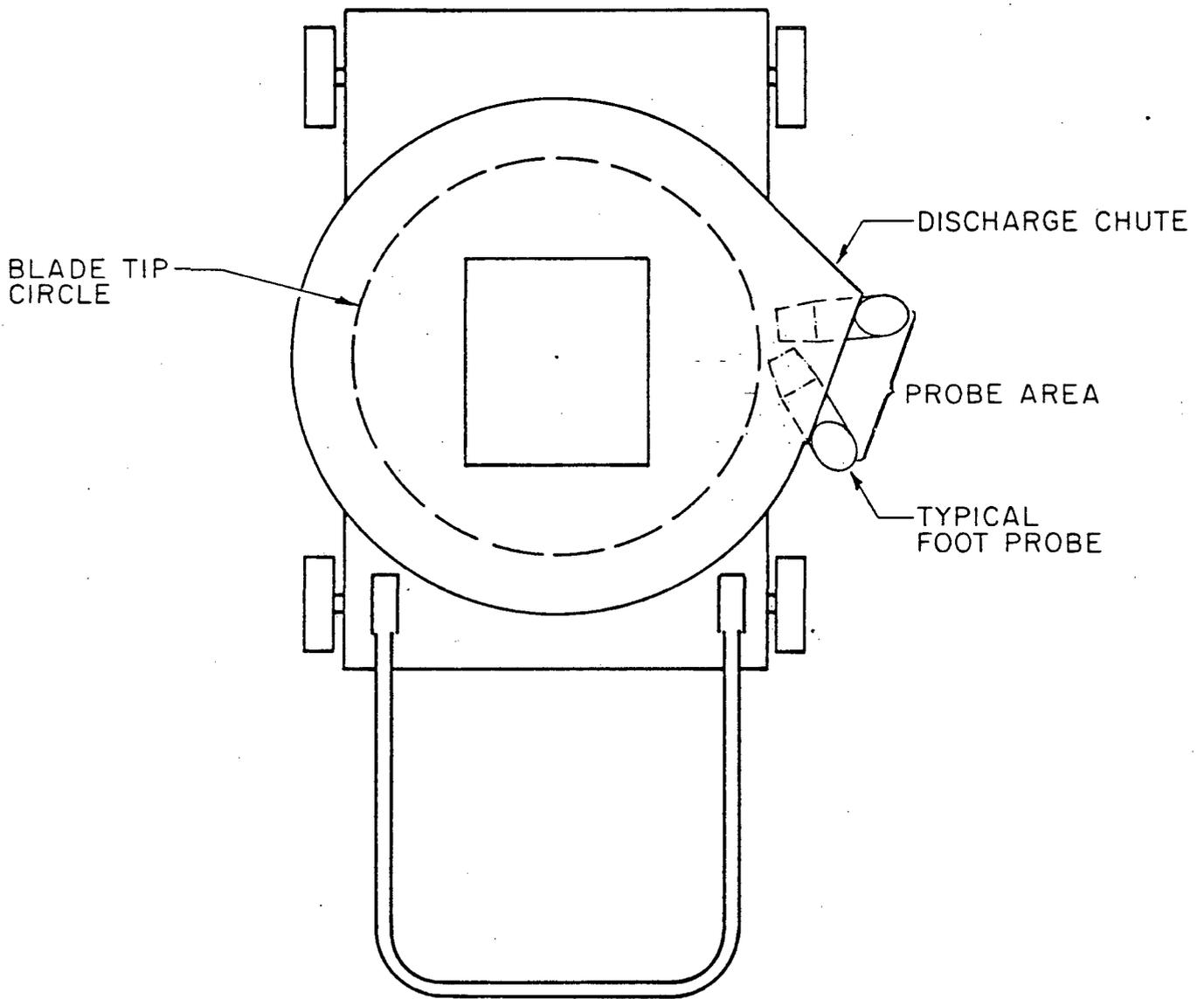


FIG 5—PROBING DISCHARGE CHUTE
WITH FOOT PROBE

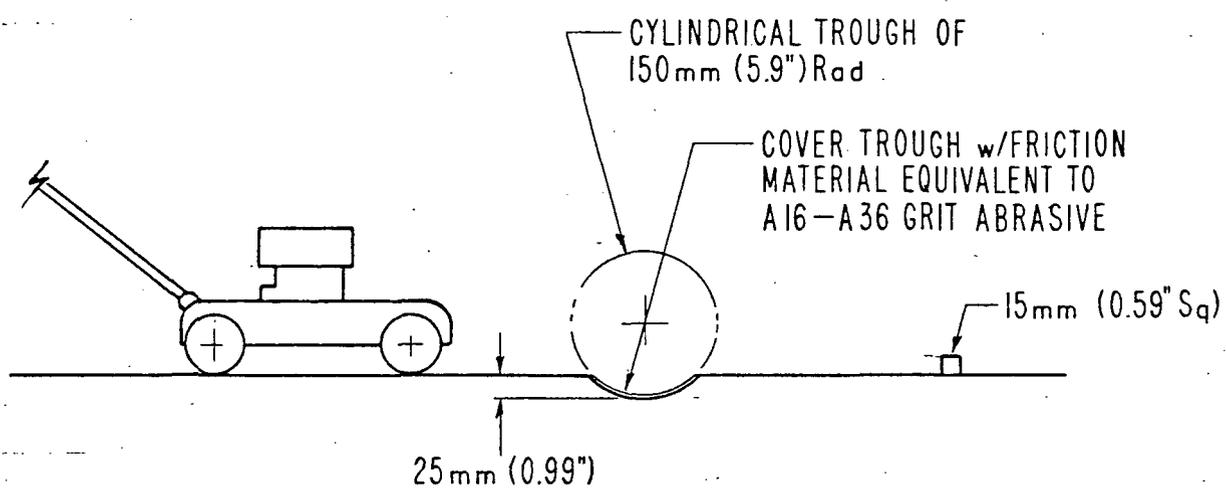


FIG 6—OBSTRUCTION TEST FIXTURE

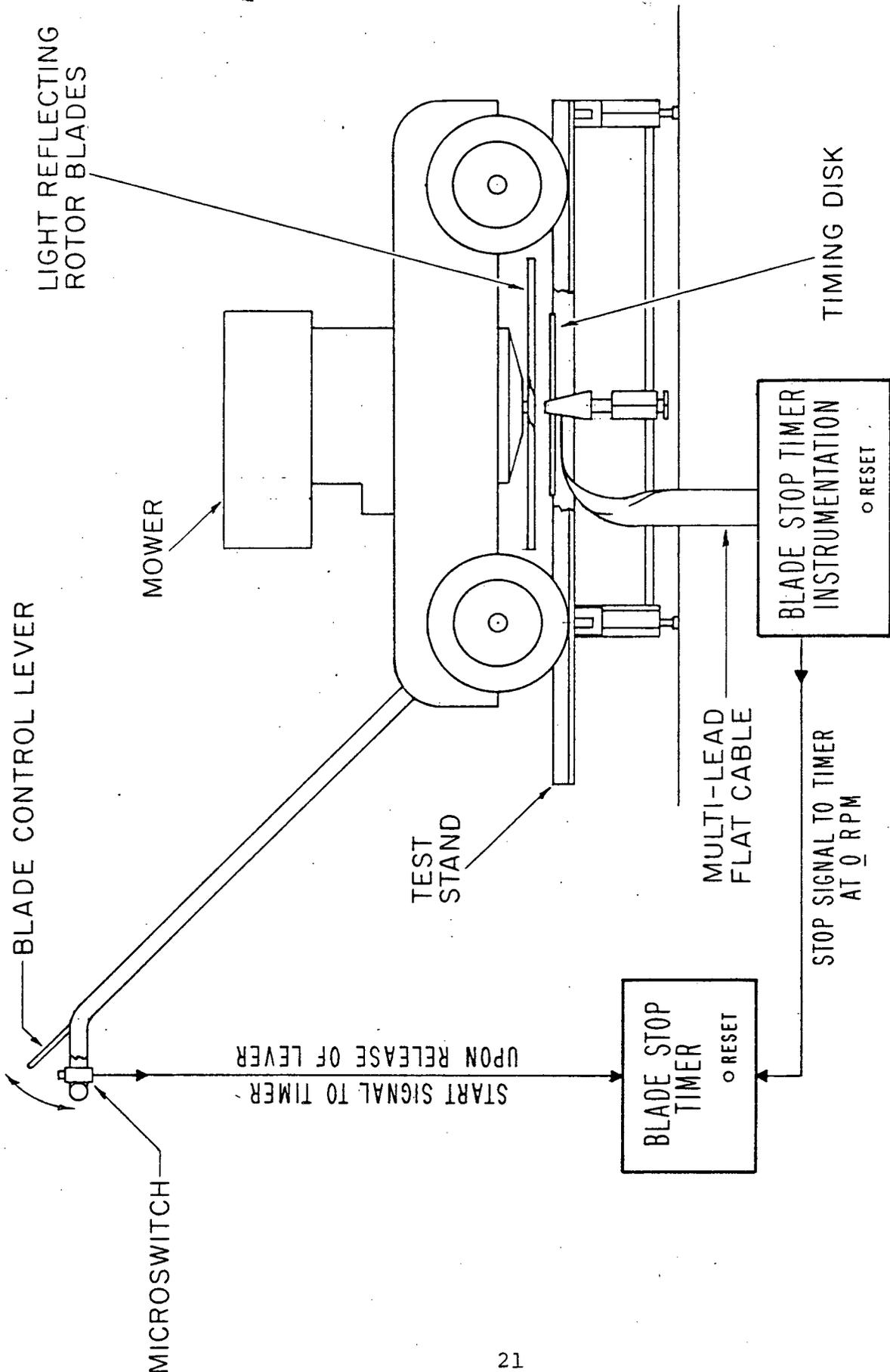


FIG 7—BLADE STOPPING TIME TEST INSTRUMENTATION

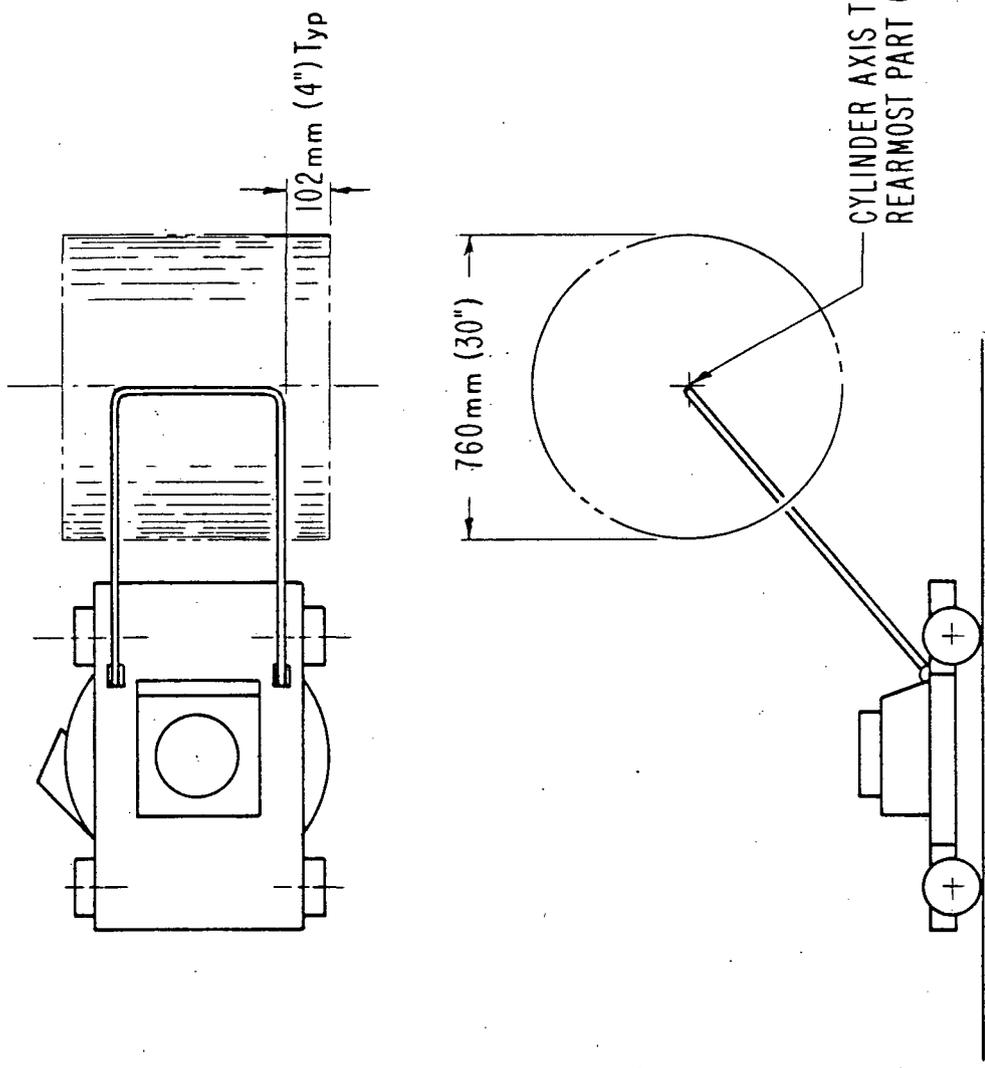


FIG 8—OPERATING CONTROL ZONE

CPSC TEST REPORT FOR POWER LAWN MOWERS

DATE: _____

SAMPLE NO: _____ SUB NO: _____

MANUFACTURER: _____

MODEL: _____

APPROVAL RECORD

Test Technician(s) Date

Test Engineer Date

Supervisor Date

CPSC TEST REPORT FOR POWER LAWN MOWERS
 Sample Number: _____

REFERENCE PARAGRAPH		REQUIREMENT	OBSERVATION OR MEASUREMENT
TEST MANUAL	REGULATION		
III. A.	1205.4(a)(1)	Shields shall prevent foot probe in Figure 1 from entering the path of the blade with and without auxiliary equipment. (1) location of contact (2) depth of penetration into the plane of the blade	
III. B.	1205.4(a)(2)	Shields shall not permanently deform, separate, or crack when subjected to 50 lbs (222N) static tensile force. (1) location of deformation, separation, or crack	
III. C.	1205.4(a)(3)	Shields shall not stop mower, enter path of blade, or cause more than one wheel to lift during obstruction test. (1) does shield stop mower (2) does shield enter path of blade (3) does more than one wheel lift	

Comments:

CPSC TEST REPORT FOR POWER LAWN MOWERS

Sample Number: _____

REFERENCE PARAGRAPH		REQUIREMENT	OBSERVATION OR MEASUREMENT
TEST MANUAL	REGULATION		
III. D. 1.	1205.4 (c) (2)(i)	Shields when deflected to their extreme open position shall return automatically to a position that meets the requirements of III. A. B. and C.	
III. D. 1.	1205.4 (c) (2)(ii)	Shields when deflected to their extreme open position shall prevent operation of the blade(s) unless the attached equipment is present or the moveable shield is returned to a position that meets the requirements of III. A. B. and C.	
III. E. 1.	1205.5 (a) (1) (iv)	Mowers with an engine and manual starting controls shall have a blade control that stops blade without stopping engine.	
III. E. 2.	1205.5 (a) (1) (i)	Blade operates only when blade control is actuated.	
III. E. 3.	1205.5 (a) (1) (ii)	Continuous contact with blade control required for blade to be continuously driven.	
III. E. 4.	1205.5 (a) (2)	Additional manual means to be actuated before stopped blade is restarted. 1. Separate control from blade control means or 2. Blade control with two distinct motions or double-acting device.	

Comments:

CPSK TEST REPORT FOR POWER LAWN MOWERS
 Sample Number: _____

REFERENCE PARAGRAPH		REQUIREMENT	OBSERVATION OR MEASUREMENT
TEST MANUAL	REGULATION		
III. E. 5. *	1205.5 (a) (1) (iii) 1205.5 (b)	Blade motion in the normal direction of travel shall come to a complete stop within 3.0 seconds after release of the blade control.	
III. F.	1205.5 (c)	Mowers with blades that begin operating when the power source starts shall have their normal starting means located within the operating control zone.	

*Stopping Time Data
 Run time prior to test _____ min.

Comments:

<u>Run No.</u>	<u>Stopping Time(sec)</u>
1	_____
2	_____
3	_____
4	_____
5	_____
6	_____
7	_____
8	_____
9	_____
10	_____

CPSC TEST REPORT FOR POWER LAWN MOWERS.
EQUIPMENT USED FOR MEASUREMENT
Sample Number: _____

NAME	MODEL	SERIAL NO.